The environmental auditing of green spaces within cities with implications for management systems

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The Environmental Auditing of green spaces within cities with implications for management systems

- with reference to Durham City

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ABSTRACT

The study was carried out to assess the management and overall importance of green spaces both for a city, it's human population and also for the associated wildlife. A diverse range of different land categories make up green sites in cities. Durham City exhibits many land use types also, but it is also different from most other cities, in that it has been designated a World Heritage Site (1987).

This study was implemented with the acquisition of baseline data which included history and flora/fauna records. A noise and pH survey was carried out within the city and green spaces and a litter and flytipping visual assessment was carried out on each of the green spaces.General mitigation measures were suggested for reducing dumping and flytipping on these sites. Interviews were also conducted with the City/County Council, University, Dean and Chapter and private land owners to discover past and current management practices.

Noise levels were recorded above 60dB(A) - according to the Institute of Environmental Assessment, a day time noise above this level would need mitigating measures. Higher noise levels were mostly due to traffic. It was judged that the effect of traffic on green spaces in Durham City was minimal, however mitigation measures were suggested. The pH survey recorded an average pH of 6.2 over the area, this is an adequate pH level for most plants, although the findings serve only as a guide.

Recommendations for the future management of specific green sites appear in individual sections. The main recommendations refer to managing green spaces with greater sympathy for the environment, teaching the importance of green spaces in cities through education and utilising this to implement better management techniques and preserve existing green sites in cities for future generations.

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1.0 INTRODUCTION

This twelve and a half month study was produced inconjunction with the planning Department of Durham City Council, (hereinafter referred to as The Client) and the Environmental Management Department at Durham University.

This is an introductory study in Environmental Auditing and the establishment of a bank of baseline data for the Durham City area. If further work is carried out on any of these sites this baseline data will be more available.

Many local authorities are now producing environmental audits and some have appointed specialists for this purpose, a general problem has been the definition of benchmark criteria against which environmental performance can be audited. Some progress has been made on this, Newcastle City Council (1989), for example have adopted measurable indicators based on socially acceptable standards in relation to:-

- Energy conservation and materials recycling.
- Public health, water and air pollution.
- Waste disposal and refuse collection.
- The Council's buying policy.
- Transport conditions.
- The 'living city' (i.e. the city as a place for people and wildlife).

Councils which undertake audits may find them helpful to their activities in various ways. Firstly the provision of comprehensive analyses of the present condition of the environment will assist in the monitoring of future change, identification of critical information gaps, and adoption of remedial and anticipatory policies. Secondly examination of the determinants of current environmental conditions will indicate the impacts arising from trade, industry and the Council's own activities; this will help

reinforce negotiations with other organisations and act as a spur to improving their own performance.

Thirdly, monetary and other budgets for the environmental audit must be selective. However, such selectivity must ensure that the length of time over which monitoring and survey are undertaken is appropriate to the task in hand. For example, for certain environmental features (e.g. many types of flora and fauna), a survey period of 12 months or more may be needed to take account of seasonal variations. Sampling procedures will often be used for surveys; the extent and implications of the sampling error involved should be clearly established.

The quality and reliability of environmental data can vary a great deal, and this can influence the use of such data in the assessment of impacts of management. Fortage (1990) clarifies this in the following useful classification:-

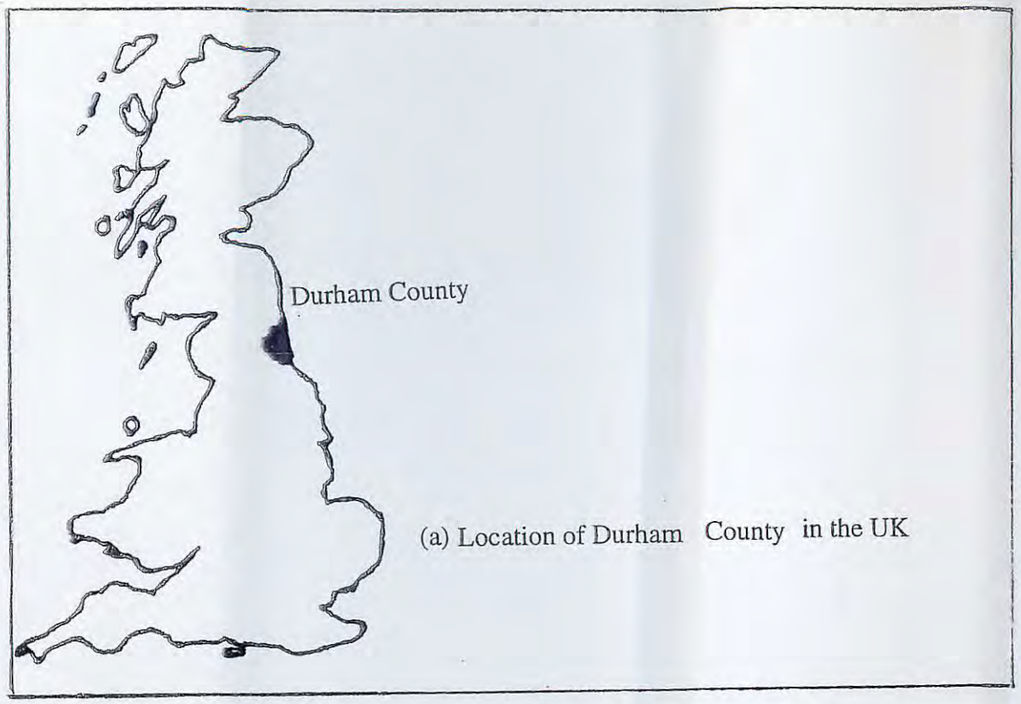
- "Hard data" from reliable sources which can be verified and which are not subject to short-term change, such as geological records and physical surveys of topography and infrastructure;
- "Intermediate data" which are reliable but not capable of absolute proof such as water quality, land values, vegetation condition.
- "Soft data" which are a matter of opinion or social values, such as opinion surveys, visual enjoyment of landscape, and numbers of people using amenities, where the responses depend on human attitudes and the climate of public feeling.

1.1 Background to the research of Durham City green space

1.1.1 The environment of Durham City

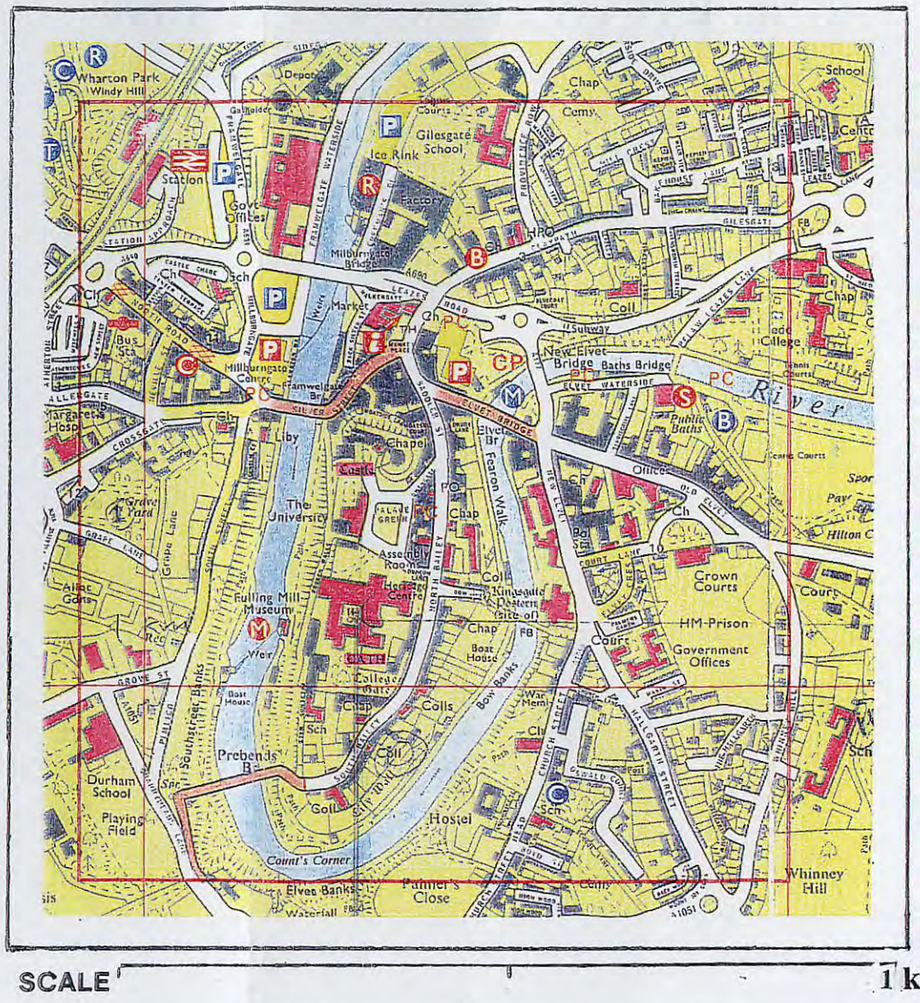
The city of Durham District, with an area of 186.88 square km lies at the centre of County Durham and at the heart of the north east region, between the Tyneside and Teesside conurbation. Durham's central urban area has a population of 40-45,000 (Durham County Council, 1991).

As well as being a focal point for cross country travel with good main line railway and road links to the north and south, Durham is a major sub-regional commercial and educational centre. In addition to its own local economy, Durham is well placed with regard to employment in the region and has traditionally experienced lower rates of unemployment compared with many other districts (Durham County Council,1991). Although once very dependent upon coal mining the remaining extraction of coal is undertaken by opencast method and many colliery sites have been reclaimed although the landscape still bears the impact of development; in particular the mining settlements which are widely distributed throughout the district. Durham is a historic, architectural and cultural city of international importance as recognised by the designation of the area around the Cathedral and Castle as a world heritage site since 1987.The Cathedral has been acclaimed as one of the greatest achievements of the Romanesque style in Europe. Together with the Castle, the Cathedral stands high on the peninsula framed by a loop in the River Wear valley and set within a natural bowl containing the pre 1900 built up area of the town (**Figure 1.1**).



(a) Location of Durham County in the UK

(b) Location map of Durham City in relation to County Durham



(c) Ordnance Survey location map of Durham City

Fig 1.1 Location maps

There is a predominant level of open space along the riverside and also a substantial amount of woodland which accentuates its landscape quality from an amenity viewpoint, creates a haven for wildlife and also an outdoor recreation resource.The city is a chief tourist attraction with 0.8 million visits made by UK residents and 0.13 million day trips made by overseas visitors per year (Day Visits Survey 1991\92 Northumbria Tourist Board 1995). Durham Cathedral and Castle rank among the north of England's main tourist attractions, with an estimated 431,586 visiting the Cathedral in 1995, (Northumbria Tourist Board, 1995).

1.2 The history of green space in Durham City

1.2.1 Medieval up to the Eighteenth Century

In Britain, the origin of parks and gardens can be traced back to the middle ages. Landscape and architecture are inseparable in Durham just as the buildings of the city have endured countless repairs and modifications to their fabric, so too have the open spaces between them -the gardens, parks and riverbanks. Evidence of medieval gardens lies predominantly in records and documents. Little survives today of these gardens beyond much repaired boundary walls. Tenement gardens are noted in 1388, many were sited under the moat. Two gardens on Kingsgate were on waste land below the present St Chads College. Their primary purpose was for vegetables, herbs and possibly fruit as well as medicinal and decorative reasons.Whether the decline in the castle's military role in the late medieval period is reflected in greater space being found for gardens is unknown (Roberts 1994).

The greatest documentary evidence comes from records kept by the monks for the priory gardens. The monostatic buildings occupied a very restricted site at the end of

the peninsula and to provide the necessary gardens and orchards to support the monastery required large cultivated areas on neighbouring banks. The walled gardens of the infirmary master supplied him with medieval herbs for the hospital of Mary Magdalen.The monastery's outer court was turfed with a herb garden which was formally planned with a central lawn and grass walks. At the reformation the priory's west orchard was annexed to St Margarets churchyard and now serves as an open space for the surrounding community (Roberts 1994).

1.2.2 Eighteenth to the Twentieth Century

The major contribution of green space to Durham was the planting of the peninsula during the 18th century. Dr Joseph Spence an accomplished garden designer was one of the first to introduce new paths and planting during his residency 1754-68. The tree planting included both native and non native.By the mid 19th century the transformation from defensive bare banks to treasured 'romantic' landscape was complete.(**Figure 1.2**)

During the 18th and 19th centuries, little major landscape work was carried out in Durham to equal the transformation of the riverbanks.

Private houses of the baileys developed extensive gardens, maps of the city dated 1754 show some of the garden plans.

In the 20th century, it is the University that has done most to create new parks and gardens in the city. The South road colleges of Van Mildert and St Aidans (their gardens are open to the public) and are particularly noteworthy as is the botanical garden established 1970.

The Terraced Gardens of Old Durham are also undergoing archaeological excavation

restoration and replanting to their original 17th and 18th layout after being bought by the City Council in 1985.

Fig. 1.2 'Durham Banks', an engraving by Bailey 1781 (showing extensive tree planting), from W. Hutchinson's book, '*The History and Antiquities of the County Palatinate* (1787)

In the present landscape the emphasis has been on the protection of the Durham setting, not just in the environs of the river but also on the protection of the city 'bowl'(Roberts 1994).

1.3 Physical conditions

1.3.1 Landscape

The landscape around Durham contains a rich and diverse ecology. Growing conditions for vegetation vary from soils of a damp and acidic nature in the west to better drained limestone soils in the east. Abandoned mineral workings and disused railways have in some cases broadened the representation of plant life and animals (Durham Wildlife Trust 1994).

The banks of the Wear valley, for example contain many distinctive areas of established woodland. In addition to the wooded areas there are extensive areas of grassland and scrub. As well as recreational landscaped and wilderness areas.These areas represent large tracts of amenity open space with public access and established footpath networks. Significant areas include, the Low Newton Junction, nature reserve, Pelaw wood, Hoppers wood and Flass Vale.

In addition to these areas there are sites within Durham offering tranquillity and commanding views of the city, Western Hill, Windy Hill and Wharton Park (**Figure 1.3**).

Sites of Special Scientific Interest (S.S.S.I.) or local ecological importance occur in and around Cassop Vale, Quarrington Hill, Shadforth Dene, Pittington Hill, Coxhoe Bank and Sherburn Hill. Of the nine S.S.S.I.'s in the district, seven are associated with the limestone outcrop in the eastern area of the district. There are also seven County Wildlife Sites in the Durham City area, these are Hopper's Wood, Pelaw Wood, Houghhall, Maiden Castle and Little High Woods, Frankland Pond and Blaids Wood. Two main types of wetland are found in the District, ponds which are either man-made and ponds which occur naturally, good examples of these can be found at

Fig. 1.3 View from Wharton Park, (Grid Ref NZ 269 429) across Durham City

Frankland and North Brasside. There are also poorly drained areas of land or surfaces prone to flooding and marsh conditions such as the Carrs, at Pity Me.These wetland areas generally contribute to the range of wildlife in the district and increase the value of the landscape. The finest attributes of Durham's urban and rural landscape are recognised in 14 designated Conservation Areas. One of these extends over the central area of the 'bowl' of Durham City, including the older parts of Gilesgate, Neville's Cross and Western Hill incorporating important green areas in the surrounding locality (County Durham, SoE Report 1993).

1.4 Durham City - a designated Conservation Area

This designation is used selectively by Council's to judge areas with strong environmental or architectural quality. In Durham, development is carefully controlled to maintain the special character and value of the area (**see Appendix 1**). Demolition of a building in a Conservation Area must be capable of being justified and there is additional protection for trees in the form of Tree Preservation Orders. (Conservation in the Wear Valley, Environment Department, Durham County Council 1990).

1.4.1 Area of Great Landscape Value (A.G.L.V.)

The City of Durham is surrounded by an area of Great Landscape Value (A.G.L.V) which was incorporated into the County Development Plan in 1969. The present plan indicates an Area of Great Landscape Value;

> *Restrictions will be imposed on the amount and type of development in the A.G.L.V. in the interests of preserving its landscape character. Generally, development will be limited to agriculture and recreation or to compatible uses already within the area.*

The Area of Great Landscape Value displays two main physical characteristics:-

1. The most important features are the Wear and Browney Valleys. North of the city centre the Wear flows in a narrow, meandering gorge with well-wooded sides. South of the city centre the valley floor is much broader but still retains well-wooded slopes. The Browney Valley contains substantial and attractive pockets of woodland where the valley narrows and steepens along the western edges of the Durham Bowl, before it breaks through at Croxdale.

2. The other feature is the outer slope of the Durham Bowl. The western southern and eastern edges of this, form an almost continuous belt of woodland.

The A.G.L.V. also contains several areas of parkland landscape but some of these are only remnants and urgent action is needed to preserve and replace the tree stock. The A.G.L.V. therefore includes a variety of natural and man-made features of interest which make an important contribution to the attractive landscape of the area.

1.4.2 Landuse

The predominant uses in the area are agriculture and woodland. Much of the woodland, which is mainly deciduous and not managed commercially, is of outstanding importance to the approaches and setting of the central urban area. The attributes of the area make it popular for outdoor recreation. Public footpaths are well-used and the plan includes proposals to increase recreation in the Finchale and Frankland Area and at Bearpark. A large part of the A.G.L.V. at Maiden Castle and the Racecourse is used as playing fields.

The siting, design and use of materials in any development that may be permitted will be critical. From several aspects in the A.G.L.V. There are distant views of the Cathedral and it is imperative that no physical intrusion should detract from these views.

1.5 Policies in Durham City for the protection of green space

1.5.1 The City of Durham Charter document

The City of Durham Environmental Charter document is a statement of intent that looks at the ways in which the City council can seek to use measures to enhance the

City of Durham and maintain its environment.The Charter is subheaded into :-

- Energy.
- Recycling.
- Pollution.
- Transportation and Planning.
- Environmental Protection and Enhancement.
- Health.
- Purchasing and Economic Powers.
- Public information and Consultation.
- Implications of Council Decisions.

1.5.2 Environmental protection and Enhancement policy

The policy is set out here in its entirety:-

Landuse/Landscape

- To ensure all land is maintained to acceptable standards.
- To reclaim and encourage others to reclaim for uses beneficial to the community, all vacant derelict or neglected land throughout the city.
- To increase, protect and improve existing green space in urban areas and increase their usage for recreational and amenity purposes.
- To ensure all communities have access to adequate green space provision within reasonable distance from their homes.

The following measures were agreed upon by the City Council in the environmental section of the City Charter, in order to ensure that the environment of Durham City continues to be properly managed and protected:-

- Ensure that schemes undertaken by or on behalf of the Council are properly maintained afterwards.
- Continue the programme of land reclamation's where opportunities arise, making full use of grants that are available.
- Adopt practices and designs for land in Council ownership or control which minimise the need for maintenance; and where maintenance is required ensure that only environment-friendly materials are used.
- Produce an environmental audit of all land and buildings in Council ownership or control, and thereafter proposals for their conservation and enhancement.
- Seek to increase public accessibility to green spaces and wherever possible develop these spaces into a network linking sites to each other and the countryside.
- Continue to protect trees and woodland through Protection Orders and enforce against wilful damage to such protected trees.
- Insist on high standards of landscaping as conditions of planning approvals where appropriate.
- Plant more trees to create more woodlands and encourage others to do so.
- To continue to ensure that only essential development takes place within the countryside and that any such development takes due regard to the need for new landscaping.

- Achieve higher standards of landscaping and environmental quality in all new council buildings and refurbishment schemes providing the appropriate resources as necessary.
- Countryside management schemes to improve and encourage respect for the landscape and with other agencies encourage farmers, and landowners to plant trees and manage their land in such a manner as to enhance the environment.
- Encourage those involved in the economy of agriculture, to respect the balance of nature in their use of the land and to use powers and lobby for action against those who abuse the landscape to the detriment of the community or the environment as a whole.
- Endeavour to enhance the conservation of the landscape to educate and encourage those who depend on the landscape and land use for their livelihood, and to encourage those who use it for recreation and enjoyment, to respect the countryside.
- Within the Landscape Improvement Area designated in the Local Plan particular attention will be paid to reclamation of derelict land and the planting of trees.
- To undertake an Environmental Audit of the whole city.

1.5.3 The County Durham Structure Plan and Durham City Local Plan Review

This County structure Plan Review sets out the strategic planning policies that will guide the future development and use of land within County Durham and Durham City to the year 2006. Below are the policies in the plans concerning green space land in Durham City (County Durham Structure Plan & Durham City Plan,1995):-

- The existing north, western and southern wooded horizons to Durham must be maintained.
- No development will be allowed which would protrude above the trees on the horizon or which would necessitate the loss of any mature trees in these areas.Tree planting conditions may be imposed to maintain and enhance the character of these areas.
- The green wedges of land, from the north through sidegate from the west through Flass Vale and from the east across the Racecourse should be preserved.
- This will need to be implemented by limiting development, by tree planting conditions and through positive planting and schemes of enhancement.
- The importance of environmental matters is further highlighted by policies to protect the built, historic and the natural environment and by seeking to protect the countryside from inappropriate development.
- The character of Durham depends not only on the major features of the Cathedral and Castle but also on the way in which the surrounding streets and individual buildings, and alterations to existing ones should recognise the essential characteristics of the existing townscape.

- In applying the principle of sustainable development there are policies relating to the location of new development and to renewable resources, pollution prevention and energy conservation.

1.5.4 Transport policy issues

Durham City policy (County Durham Structure Plan & Durham City Local Plan Review,1995), is to reduce the need to use the private car whilst encouraging environmentally friendly travelling by other means of local transport. To help achieve this the Local Plan includes policies that:-

- Promote cycling and walking.
- Encourage the transfer of freight from road to rail.
- Support traffic management measures.
- Investigate "Park and Ride" in the district.
- Encourage improvements to public transport.
- Seek a car parking strategy for the City Centre.

1.5.5 Recreation and Leisure

The Council's Leisure Strategy is based on the fundamental principle that a wide range of facilities and opportunities should be available to all sections of the community.

The local Plan addresses a number of issues by:-

- Seeking the development of a footpath network in the district.
- Encouraging the development of the Browney Valley for informal recreation.

- Protecting existing open space and setting a minimum standard for recreational open space.
- Encouraging recreational development at District Leisure Centres.

1.5.6 Disabled access to green spaces in Durham

There is some access for disabled people to visit some of the green spaces in Durham (Northumbria Tourist Board,1995):-

- There is wheelchair access to parts of the gardens, including Prince Bishops Garden and Visitor Centre, refreshment area and shop.
- There is wheelchair access to Houghall gardens and refreshment area. Paths are mostly on the level and of gravel or turf construction.There is also toilet access.
- There is wheelchair access to the Houghall Discovery trail on most of the paths.
- There is wheelchair access to the "Prince Bishop" River Cruiser.

1.6 Green belt land in Durham City

The local plan includes a new Green Belt which completely surrounds Durham City (**Figure 1.4**) and (**Appendix 2**).

(Policy 59) (County Durham Structure Plan & Durham City Local Plan, 1995). This is an extremely strong designation which will prevent all but very minor development

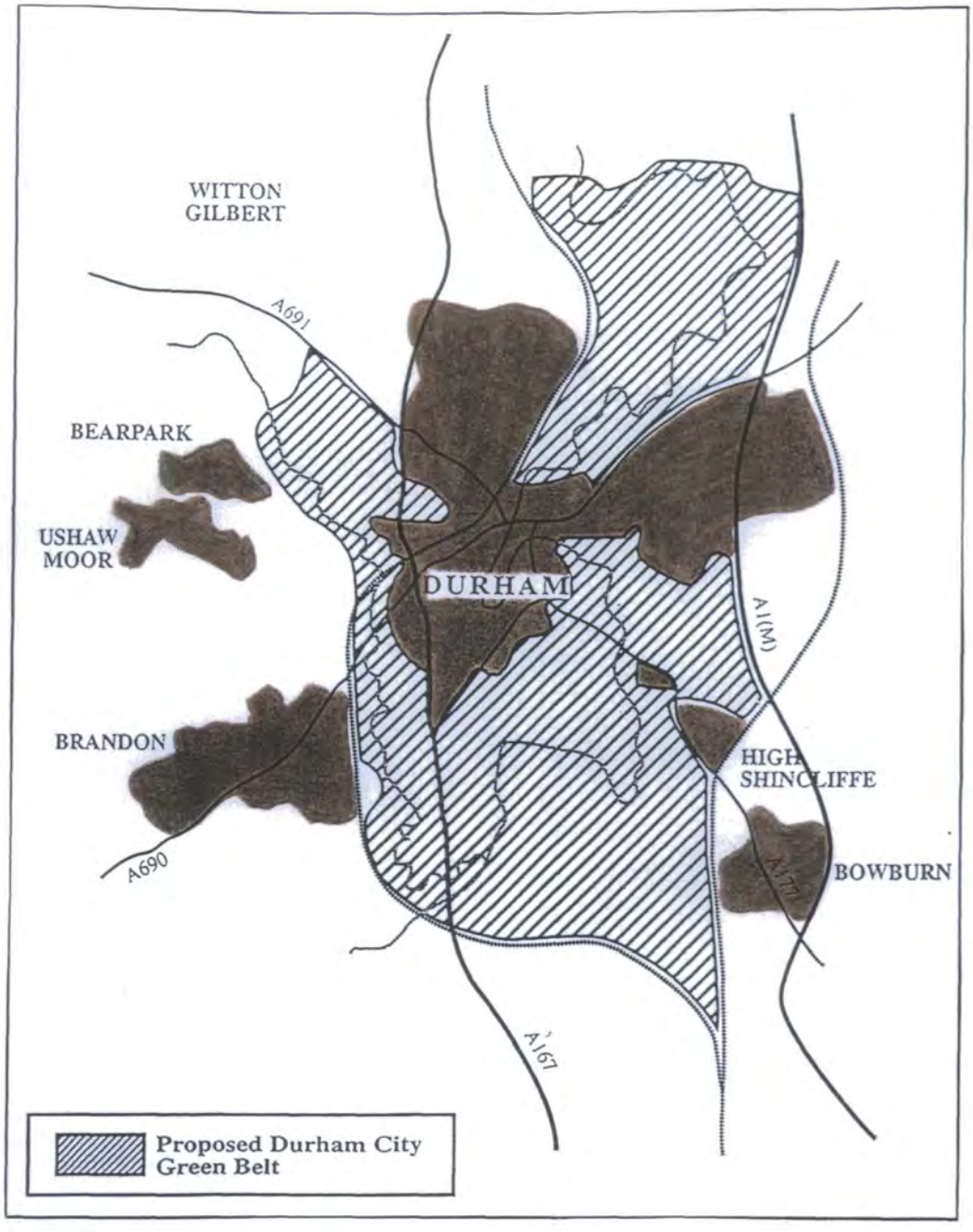


Fig. 1.4 The proposed enlargement of the Durham City green belt (Durham City Council, 1996)

and will protect the city's outstanding setting for the long term future. Durham Cathedral and Castle are internationally recognised as a World Heritage site.

The Local Plan proposes that the area covered by this designation be enlarged to

include the peninsula, the river and it's banks; areas which are vital in views to and from the Cathedral and Castle.

Policy 59 states:-

> *There shall be a Durham City green belt covering the following areas:*
>
> - *To the north of Durham City along the valley of the Wear, west of the A1(M) and east of the east coast rail line.*
> - *To the south along the valley of the Wear, west of the A1 (M) and the Leamside rail line and north of the east coast rail line excluding the existing built-up area of high Shincliffe.*
> - *To the west along the valley of the Browney east of the east coast rail line, and north east of the Lanchester valley walkway to a general line extending northwards to Earls House and south west of the A691.*

1.7 Climate

County Durham is one of the driest counties in England as it is sheltered by some of the highest peaks in the pennines. Influenced by the coldest part of the North Sea, it also has less sunshine and more cloud cover than any other part of eastern England.

1.7.1 Temperature

The average temperature across the County is 15°C in July/August (which is 2°C below the UK average) and between 3°C and 4°C in January/February, (around the UK average).

The threshold temperature for the plant growing season is 6.1°C. The season lasts from April to mid-November in lowland Durham, but at 500m this is reduced to five and a half months. On the coast the season is extended although problems of mist and

salt spray may in fact make plant growth more difficult. The growing season varies not only in temperature but also in days in different parts of the UK (**Figure 1.5**).

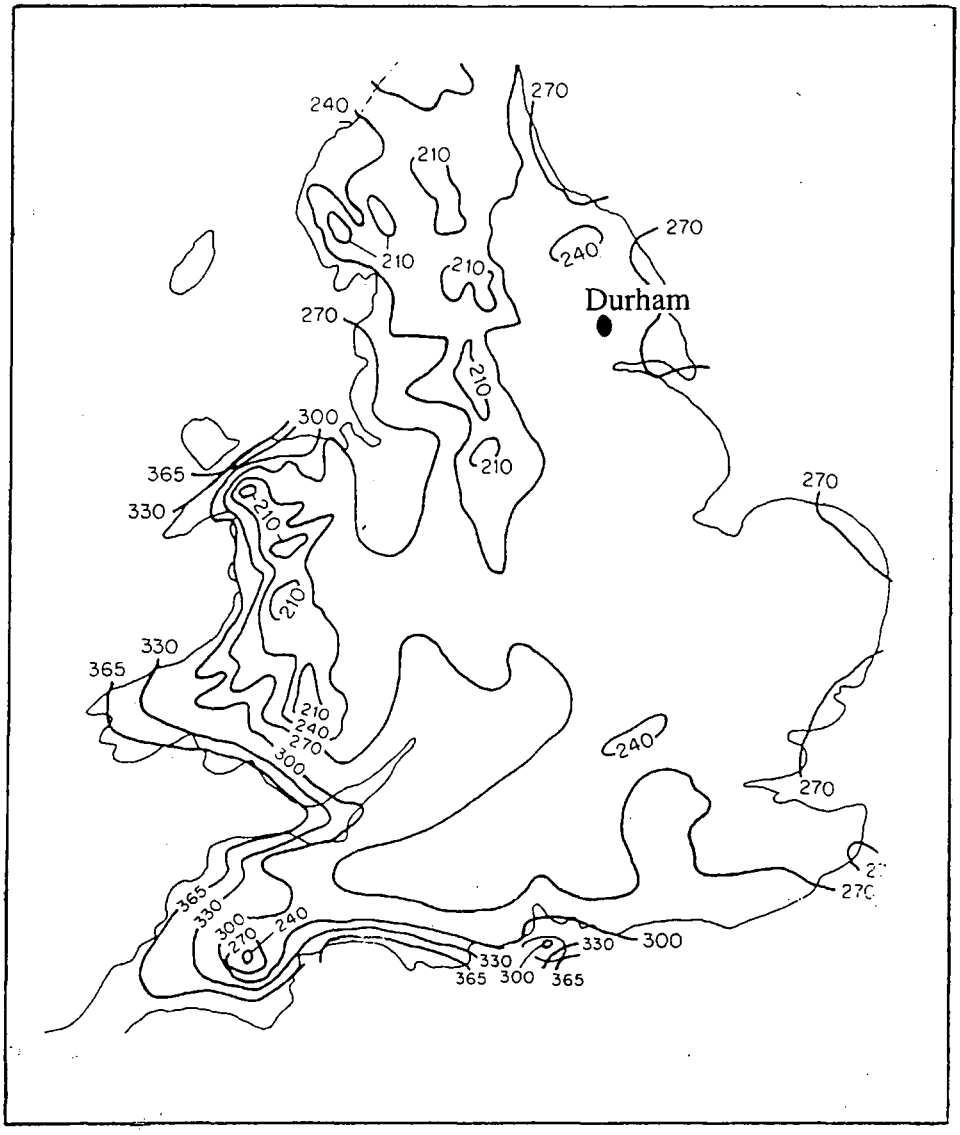


Fig. 1.5 Map of the average duration of the growing season (days) over England and Wales (after Selman, 1992)

Air frosts can occur from October to mid-May and ground frosts in any month except July. Local topography can have a remarkable effect on frost formation. For example, a frost pocket occurs at Houghall, 1.5 km south-east of Durham city, where temperatures can be as much as 8°C lower than the surrounding area. Built-up areas

act as heat islands, trapping the warm air from buildings. The effect is most marked at night and in Durham and particularly the Market Place, the temperature can be up to 2°C warmer than the outskirts of the city. This phenomenon causes heat lift above the city centre, and can cause concentration of smoke and dust pollution (County Durham, SoE Report 1993).

1.7.2 Rainfall

Rainfall is largely influenced by height, with the west of the County being much wetter than the east. The highest rainfall in the Durham City area occurs August to November (**Table 1.1**). It is usually more intense but of a shorter duration than the rain in the west and combined with the Victorian drainage system of the city can lead to severe flooding in the River Wear (**Figure 1.6**).

Rainfall is dependent on prevailing westerly winds, the Pennines provide shelter from these, so that the County is in a rain shadow area. Easterly winds do increase the amount of rain in the east of the County, but also increase the chance of damage to plants from salt burn by the sea air. In recent years winds have been mainly from the south west, and as the County has greatest protection from this direction, rainfall has been considerably lowered (CountyDurham, SoE Report 1993).

Month	Mean Temp (°C)	Avg. Rainfall (mm)	Avg. no. Rain Days	Avg. no. Ground Frost Days
JAN	3.0	56.7	17.3	19.6
FEB	3.2	46.6	14.7	16.8
MAR	5.1	44.1	14.9	15.9
APR	7.6	43.7	12.3	10.5
MAY	10.1	50.6	13.9	5.4
JUN	13.2	47.9	13.3	0.9
JUL	15.1	57.4	14.0	0.1
AUG	14.8	66.0	14.0	0.1
SEP	12.6	60.2	14.0	2.1
OCT	9.5	57.5	15.0	5.4
NOV	5.9	64.4	16.9	11.9
DEC	3.9	56.9	16.9	16.2

Table 1.1 Durham Observatory climate statistics (Averages 1930-Present)
- Durham Observatory Statistics: Averages 1930-Present), (Newcastle Weather Centre

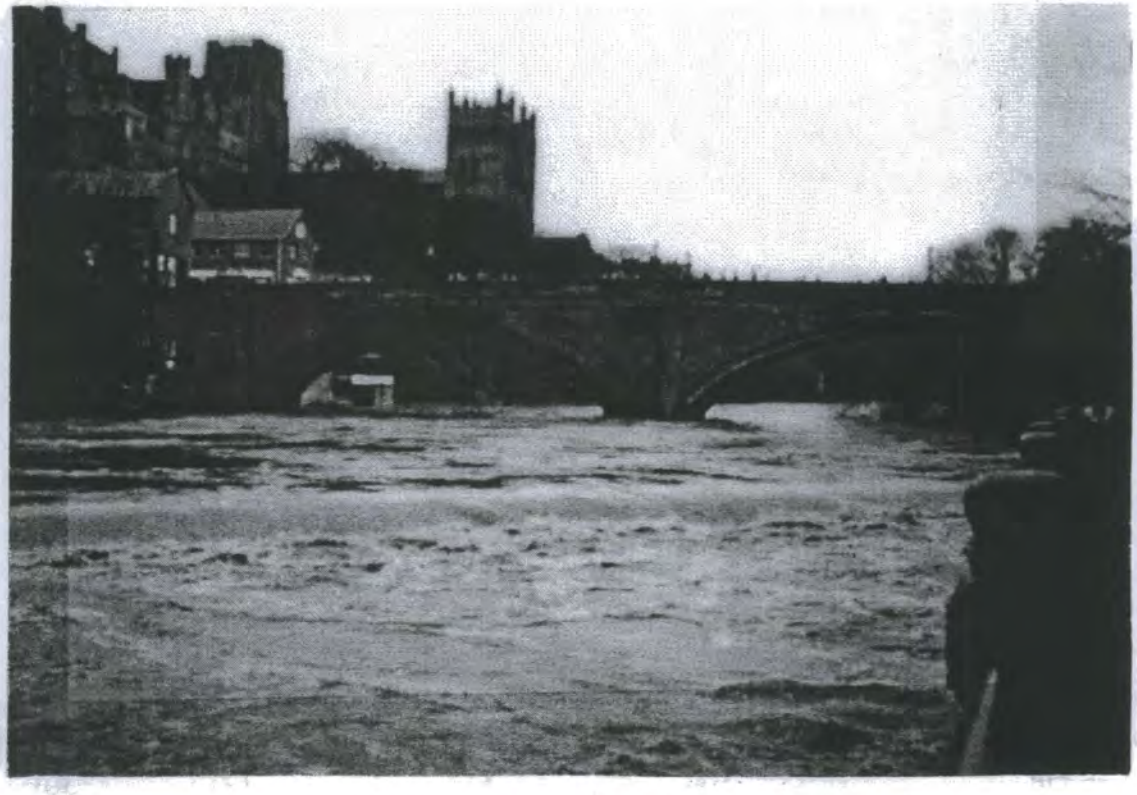


Fig. 1.6 Framwellgate Bridge, River Wear in flood (Durham Record 1991)

1.7.3 Snow

The snow contour is at 250m; below this height, snow usually melts, above it, it usually lies.The average period of snow cover increases from east to west, from eight

days on the coast, 17 at Durham and 40 at Alston in Cumbria. Snow tends to lie longer on north facing slopes and in south east parts of the County.Generally the worst snow problems are caused by cold easterly winds depositing large amounts of snow which lie for long periods, giving the County a reputation for having the greatest depths and longest snow falls in England, although in Durham City car fumes and heat from buildings usually dissipates the snow relatively quickly (County Durham SoE Report 1993).

1.7.4 Wind

Around 60% of all winds affecting the county come from the south west and carry warm air. Less frequent north-easterly airstreams are associated with much colder air and generally occur in the winter.

As would be expected, wind speeds are higher in the high pennines and on the coast. In the summer, sea breezes can penetrate inland via the river valleys. Winter can be prolonged by the influence of continental high pressure systems which bring northerly winds (County Durham SoE Report, Durham County Council,1993).

1.8 Coal mining in Durham

The Northumberland and Durham Coalfield was the site of the earliest mining for coal and was certainly the first British coalfield to be developed commercially.

Although workings by the Romans seems to have been confined to the Tyne area, much more widespread exploitation took place during the monastic period from the twelfth to the sixteenth centuries. The earliest mention of coal-mining by the monks of Durham is in 1188, but workings seem to have become important during the fourteenth century, when a considerable revenue began to be derived (Smith & Francis 1967).

By the 1830s Durham coalfields were opening up.The development of the railway system was also an important factor in the exploitation of the coal resources of the district, by 1850 a branch line from Haswell opened up the coalfield to the west of Durham City and short wagonways were in general use linking nearby pits. Many more pits were opened before this time, as for instance, East Hetton, (1836), Shincliffe, (1837), Houghall, (**see Figure 3.1**) (1841), Kepier Grange, (1844) and Bishop Middleham, (1846) (Smith & Francis 1967).

The last major colliery to be opened in this district was Fishburn in 1912. After the First World War the industry contracted and in the succeeding years, the only expansion of importance took place in the coastal area (Smith & Francis 1967).

1.9 Geology

Over the centuries, and long before geology became a systematic science, miners and quarrymen obtained a sound knowledge of the rocks in County Durham. The stratigraphical succession was first described by Westgarth Forster (1809), who summarised the data and nomenclature accumulated by the local miners and quarrymen. Forster provided a standard succession which has to a remarkable extent, withstood the test of time. His treatise appeared in three editions; the third revised by

the Rev. W. Nall, being published in 1833, nearly fifty years after Forster's death. Winch (1817) gave the first general account of the geology of the County; this was followed by books on the northern Pennine orefield (including West Durham) by Sopwith (1833) and Wallace (1861). In 1878 Professor Lebour produced a popular account of the geology of Northumberland and Durham; a second edition came out in 1886 and it was republished as the geological handbook for the British Association meeting in Newcastle upon Tyne (1889). The Durham Permian attracted the attention of early pioneers, in particular Sedgewick (1829), who worked on the Magnesian Limestone, and Howse (1848) and King (1850), who described the Permian fossils. The primary geological survey of the County was completed during the latter years of the last century, but no descriptive memoirs were published. As a result, there are few detailed works on the geology of the County, among the most important being those on the west Durham orefield by Dunham (1948) and on the Durham and West Hartlepool area by Smith and Francis (1967). Noteworthy accounts were also published by Hickling (1931) and Hickling and Robertson (1949), while both Hickling (1949), and Hopkins (1954), described the coalfield in some detail (Johnson 1970).

1.9.1 Geological History

Northumbria (Northumberland, Durham, Tyne & Wear and Cleveland north of the Tees) is dominated by rocks of Carboniferous origin (**Fig 1.7**).

On the northern margin of the area, they rest on a range of older rocks in the Scottish borders, principally Silurian sediments and the lava's of the early Devonian Cheviot volcano. Lower Carboniferous sediments which crop out on the coast of north Northumberland, form a broad belt inland, skirting the ancient volcanic pile and striking south west parallel to the Scottish border, before turning south-south east

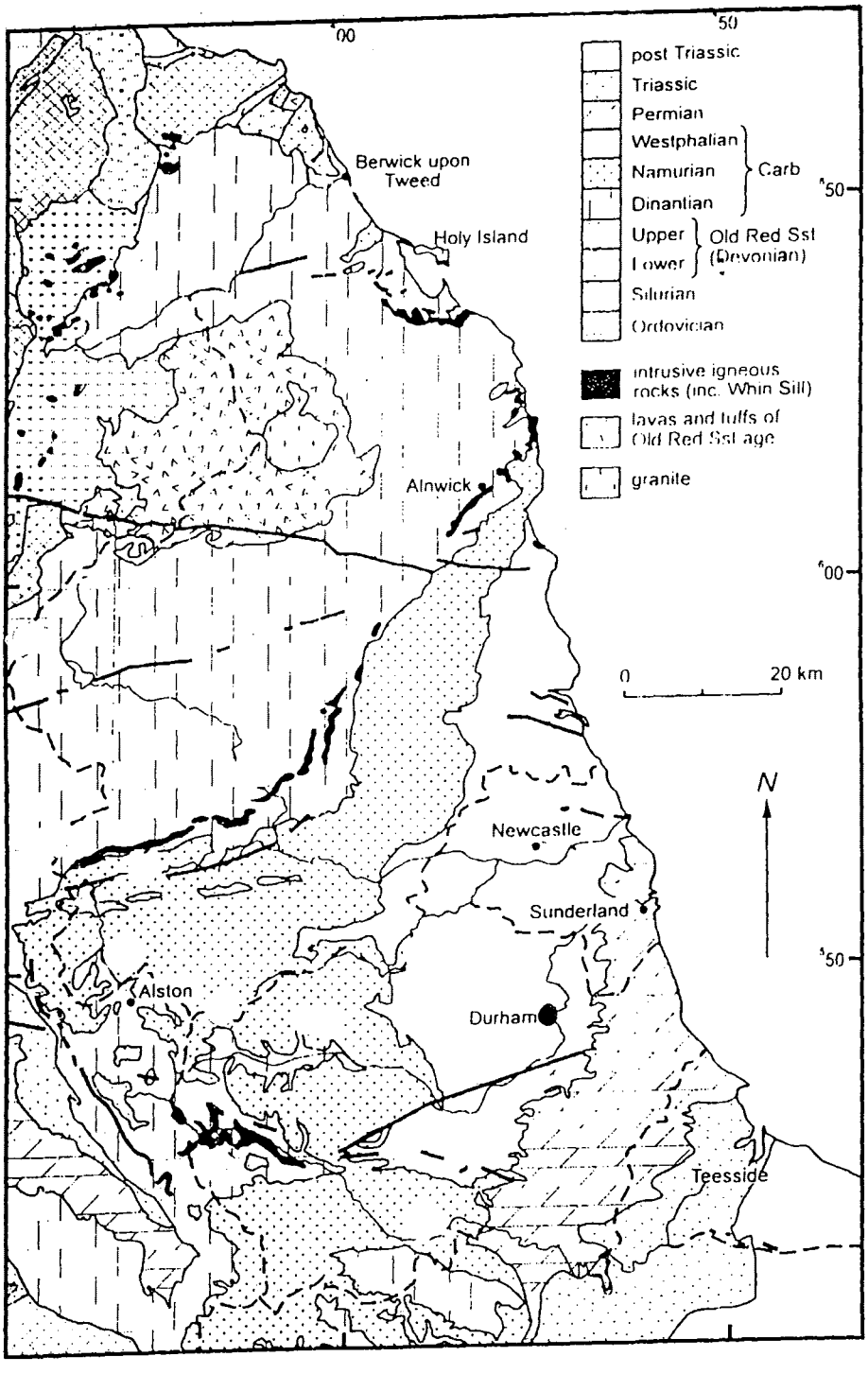


Fig. 1.7 Geological map of the Northumbria region, including Durham (modified from Scrutton, 1995)

along the Pennine front. Gentle easterly and south easterly dips bringing in the mid carboniferous to the south east, forming a narrow triangular outcrop with its apex on

the mid Northumberland coast and its base forming the north Pennine peaks and the Durham dales. The Upper Carboniferous Coal Measures in turn form the south Northumberland coast and extend inland as a north-south outcrop, widest at the Tyne and narrowing into south Durham. There the Coal Measures are overstepped by the Permian, which rests upon them. These Permian rocks form the high ground in the east of County Durham and the distinctive buff coastal cliffs of Durham and Tyne & Wear. They pass up into Triassic rocks underlying the low ground of Tees-side. Younger Mesozoic and Tertiary rocks, apart from some small igneous intrusions, are not preserved in Northumbria, but the effects of the Pleistocene glaciation are apparent everywhere. Tills mantle the solid rocks, particularly in central and South Durham (Scrutton 1995).

The oldest rocks exposed in County Durham are the Skiddaw slates of Ordovician age. They are muddy and sandy marine sediments which were slowly deposited in a wide tranquil sea. This era ended with volcanic activity, which first laid down bands of ash and interbedded with slates and followed this by vast outpouring of lava's, tuffs and agglomerates from volcanoes probably sited in the Lake District; these extrusive rocks are known as the Borrowdale Volcanic Group. Little is known of the volcanic rocks in Durham, for they are seen in small exposures only in Teesdale. These rocks, and the overlying Upper Ordovician, Silurian and Old Red Sandstone sequences, have been removed by ancient erosion from the Durham region; over much of the area a great unconformity exists between the ancient folded Skiddaw slates and the basal Carboniferous deposits (Johnson 1970).

The major earth movements, which caused uplift of the region and allowed

denudation of the Lower Palaeozoic rocks, took place in late Silurian times. They were the Caledonian earth movements and imparted a general east north-east pattern of strong folds to the Ordovician rocks. Later, during the Devonian, the vast batholith of the Weardale granite was emplaced beneath the County during the final phase of the Caledonian orogeny. The tectonic effect of the buried granite was to stabilise the region into a morphological unit called the Alston block which has been structurally positive with a tendency to steady uplift throughout its subsequent history (Johnson 1970).

Uplift during the Devonian created a land of mountains and intermontane basins in northern England. Durham was an upland area which underwent continuous erosion during the Devonian and early Carboniferous; much of the Palaeozoic cover was eroded away and the Weardale granite was finally exposed at the surface (Johnson 1970).

Until late in the Lower Carboniferous the upland region of Durham was an island in an archipelago to the north of which was the shore-line. Deep sedimentary basins developed to the north and south of this island and gradually the land area shrank and was finally submerged by the Carboniferous sea. Thin marine and deltaic Lower Carboniferous deposits are found in the area as compared with the deep basins to north and south. At the beginning of the Upper Carboniferous, marine conditions still persisted in the region, but were broken by more and more extensive deltaic episodes. Deltaic conditions dominate in the Namurian, and in the later Coal Measures deltaic and terrestrial deposition is only broken by occasional marine transgressions of short

duration. It is not known how long the Coal Measures deltas and swamps persisted in the region, for the upper part of the succession was eroded prior to the deposition of the overlying Permian (Johnson 1970).

Earth movements, which had caused gentle folding during the latter part of the Carboniferous period, reached a climax during the Carboniferous-Permian interval in the Hercynian orogeny. Uplift with doming, folding, faulting and thrusting took place and the Great Whin Sill, with associated dykes, was intruded. Mineralization of the veins of the West Durham mineral field commenced slightly later and began a process which was to continue with surges of activity for some 100 million years.

By the end of Lower Permian times East Durham had been eroded to a low desert plain on which sands and breccias were deposited. The Upper Permian Zechstein Sea transgressed across this land surface depositing first, the marl slate and then the carbonates of the Magnesian Limestone. Hot climatic conditions caused evaporites which pass upwards into Triassic red sandstones and mudstones of continental origin. The junction between the Permian and Triassic is litological and may not compare exactly with other areas. In North Yorkshire, the Jurassic lies unconformably over the Triassic red sandstone and the outcrop is continuous northwards off the Durham coast on the floor of the North Sea. It is probable that the Jurassic, and the overlying Cretaceous, were laid down over Durham although the sequences may well have thinned considerably over the positive structural region of the Alston block. Uplift and erosion during the Tertiary have completely removed the post-Triassic cover from the county so that the youngest bedrock is now the Permo-Triassic sequence of south-east Durham (Johnson 1970).

A general trend in global cooling begun in the early Tertiary and culminated in the sequence of cold and temperate climates which have affected the British Isles over the last 2.6 Ma (million years). Overlying the Carboniferous and Permo-Triassic bedrock a widespread sequence of Pleistocene drifts is present. These drifts were formed by continental ice sheets. Several advances of ice probably covered Northumbria but almost all the deposits now preserved relate to the last extensive ice sheet glaciation in the late Devensian, around 17 000 B.P. (B. P - years before present, conventionally taken to be 1950). The process of erosion of the unconsolidated drifts is still in progress (Scrutton 1995).

1.9.2 Geology of Durham City

Durham City has its origins in an ancient fortified settlement on a tight bend of the River Wear cut deep to form an incised meander gorge. The gorge is cut in bedrock Coal Measures (Upper Carboniferous) strata which are exposed, though much concealed by debris fill and vegetation. The general succession from the bottom is interbedded shale, sandstone and thin coal seams, overlain by a persistent coal seam that underlies the thick sandstone which forms the top of the gorge. The coal seam beneath the upper sandstone varies in thickness, but it is a remarkably constant feature around the gorge. The sequence was investigated by Holmes (1928) who identified the lower coal seams as the Brass Thill coals, the upper coal seam as the Low Main and the persistent sandstone, that forms the lip of the gorge, as the low Main Post. The succession in the gorge is complicated by faulting and by conflicting evidence from adjacent abandoned colliery workings. Application of subsurface colliery data caused Hindson & Hopkins (1947) correctly to introduce a fault of some 15m (50ft)

downthrow south on the north side of Prebends Bridge and they revised Holmes's interpretation by calling the sandstone immediately below the Cathedral not the Low Main Post, but the sandstone above the Upper Brass Thill Coal. This interpretation was further discussed by Dunham & Hopkins (1958). During a re-survey of the eastern part of the gorge, E.A. Francis attempted to reconcile the exposures in the gorge with the colliery data and proposed that the upper coal seam in the gorge was the Maudlin, the seam above the Low Main (Geological Survey one-inch scale Sheet 27, New Series, published 1965, p.70). In the memoir for Sheet 27, however, Francis revised his interpretation and stated that the upper coal seam in the gorge is the Low Main in agreement with Holmes (Smith & Francis, 1967). Subsurface data from construction work at Hatfield College (**Figure 1.8**) on the east side of the gorge was described by Whitworth (1972). The succession was proved and provided evidence for a north-south fault, here called Tom's Fault after Dr Thomas Whitworth, but the conflicting evidence from the colliery records was not discussed.

Geology	Metres
Grey Clay with stones	1.8
Hard gravel	0.8
Fine yellow sand	0.6
Brown clay sand with coal debris	1.2
Fine yellow sand with coal debris	0.3
Brown clay	0.3
Unexposed	0.9
Sandstone	-

Fig. 1.8 Construction Work at Hatfield College (Grid Ref 276422) revealed the following subsurface section (Whitworth 1972)

A short account of the geology of the gorge based on a re-survey was published by Johnson (1973) and G. Richardson produced a new geological map of the west side of the gorge during the revision of the Wolsingham Sheet (Geological Survey 1:50,000 scale Sheet 26, New Series, published in 1977). Both authors followed Holmes in identifying the Low Main Post as the Sandstone that forms the lip of the gorge beneath Durham Cathedral, but they realised that there was a problem in correlating the succession round the gorge with the adjacent colliery records.

The cause of this stratigraphical uncertainty was the lack of continuous exposures in the gorge, due in part to a thick cover of trees and shrubs, together with the lack of a reliable marker horizon to form a stratigraphical datum. The reliability of records from long abandoned collieries in the vicinity of the gorge was also uncertain. The best subsurface datum is the Hutton Coal, a persistent seam of good coal about 1 m thick, that underlies the area at 10m to 12m below the base of the Brass Thill seams exposed in the gorge. A programme of shallow boreholes to the Hutton Coal was planned to prove the sequence of strata and structure.

Eleven boreholes have been put down in or near the gorge between 1964 and 1984 (detailed logs are given in Johnson, 1987) and these new data have finally provided an accurate stratigraphical succession and proved the structure of the region

The first series of boreholes was put down in the gorge during 1964-65 using the Durham University Geology Department's Boyles x-ray rig under the direction of Dr William Hopkins. Two holes were drilled in May and June 1964 near to the east end of Kingsgate Bridge (NZ 276421). No.1 Borehole at the top of the gorge, produced little information and core recovery was poor. No.2 Borehole, near to river level at

33m OD (Ordnance Datum) (**Figure 1.9**) proved the section below the Brass Thill Shell Bed. During construction work on the west side of Kingsgate Bridge a very similar succession was proved over this interval (Whitworth 1972). Further holes were drilled on the west side of the gorge below the Castle and Cathedral in June and July 1965. The Fulling mill Cottage Borehole (NZ 272420) sited low on the river bank at 33m OD. Again the succession below the Brass Thill coals sectioned and the Hutton Coal proved to be 0.96m thick at a depth of 8m. These boreholes proved the position of the Hutton Coal below the promontory and confirmed Arthur Holmes's original interpretation that the sandstone on which the Cathedral stands is the Low Main Post.

At this stage, four stratigraphical boreholes had been drilled on the north-east side of the Prebends Bridge Fault which was still unproved in the gorge,G. Richardson accepted the position of the fault and predicted on stratigraphical grounds that the Hutton Seam must lie at or near to ordnance datum on the downthrow side to the south. A borehole was planned in this area, but was not drilled until 3rd October, 1974, when Dr J. M. Jones of the Geology Department, Newcastle University put down a borehole to 22.47m using a Pack Drill. This hole, (Count's Corner No.1) was sited by the riverside path at 38.25m OD (NZ 272417). It sectioned the Low Main Shell Bed at 11.28m and the Low Main Coal (lower leaf J2) 0.30m thick at 11.74m depth. Only one day was allowed for drilling and the borehole had to be abandoned before proving the Hutton Coal. In March 1979 a second borehole, (Count's Corner No.2), was drilled almost at the same site as the No. 1 hole using an Institute of Geological Sciences Edico Mark VIII rig. After 10.54m of broken ground the full succession from the Low Main Shell Bed to the Hutton Coal was sectioned with excellent core

recovery. The Top Brass Thill (K1) about 0.3m thick was proved 19.36m and the Hutton Coal, 1.15m thick was found at 35.38m depth. The correlation of the succession around the gorge was still uncertain at this stage and the geological structure remained unproved.

Elvet Colliery, almost opposite the New Inn, was near the north-west corner of the Durham University Science Laboratories site. The opportunity to check the Engine Shaft section came in 1981 when the new University Library building was in an advanced state of planning. The original Science Library was built over the shafts of the colliery (Collard 1970) and a site for drilling was chosen near the south-west corner of this building (NZ 275415) and only 25° S of the estimated site of the Engine Shaft (**Figure 1.9**). This Science Laboratories No.1 Borehole at 56m OD found the Maudlin Coal (H) 0.15M thick at 11.57m depth, the Low Main Post sandstone 10.12m thick at (I) 20.25m depth, the Low Main Coal (upper leaf J1) 0.81m thick at 47.60m and K3 0.30m thick at 51.60m depth. The Hutton Coal was proved by the presence of a cavity in open mine workings 1m high at a depth of 61.70m. The succession in the borehole agreed well with the Engine Shaft section of Elvet Colliery and the Stratigraphy and structure of the gorge was finally established. In particular it was now clear that the coal seam immediately below the sandstone at the top of the gorge was the Low main (J1) north and east of the Prebends Bridge Fault and the Maudlin (H) on the south and west side of the fault (**Figure 1.9**). The apparent continuity of this coal seam, which dominated geological interpretation for many years was brought about by two coincidences. First, by coincidence both coal seams directly underlie thick cross-bedded sandstones in the region of the gorge and, second, also by coincidence, the throw of the Prebend's Bridge Fault is approximately equal to the

interval between the Maudlin (H) and the Low main Coal (J1) in this area.

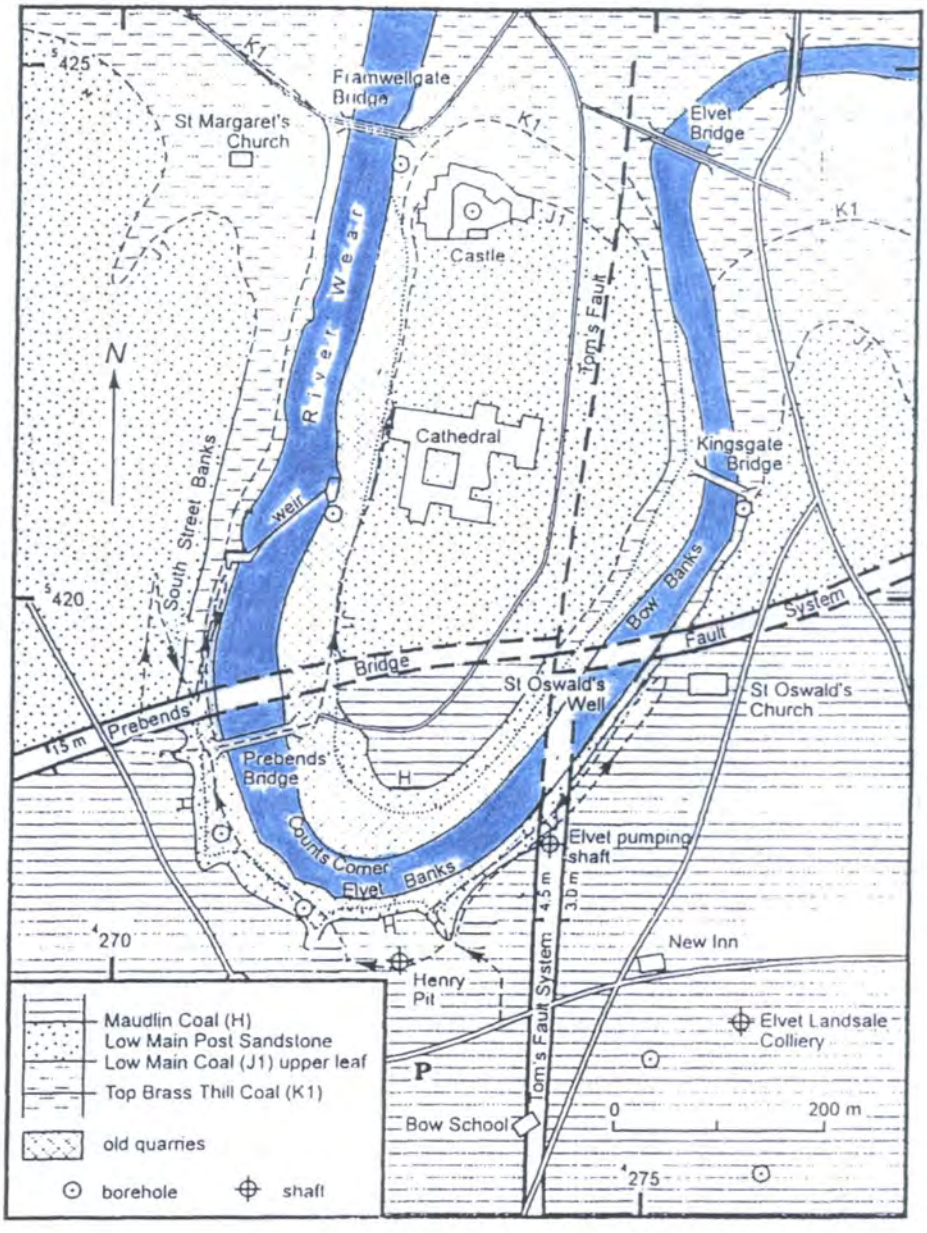


Fig. 1.9 Geological map of the River Wear Gorge, Durham City showing locations of boreholes (modified from Johnson and Richardson 1990)

Other boreholes have been added, details of the Stratigraphy and structure of the region include the University Science Laboratories No.2 and No.3 borings. No.2

Borehole at 61m AOD was drilled 30m north of Mountjoy Boilerhouse (NZ 276414) and proved the Low Main Post sandstone below 18.30m of drift. No. 3 Borehole at 95m OD was drilled on the site of the Mountjoy Research Centre (NZ 277411) and found the Maudlin Coal (H) 0.44m thick at 47.46m depth under 46.62M of drift deposits. The St Aidan's College Borehole (NZ 269410) at 100m OD and the University Observatory Borehole (NZ 266415) AT 95M OD proved 28m and 16.50m of drift respectively, but did not reach rockhead.

2.0 ENVIRONMENTAL AUDITING (EA) /STATE OF THE ENVIRONMENT REPORTS (SoE)

Both these tools can be used to yield data on the physical environment:-

Environmental auditing (EA) involves the review and assessment of an *existing* organisation's impacts on the environment.The European Community (EC) defines an environmental audit as:-

> *A management tool comprising a systematic, documented, periodic and objective evaluation of how well organisation, management and equipment are performing with the aim of contributing to safeguard the environment by facilitating management control of environmental practices and assessing compliance with company polices, which would include meeting regulatory requirements with standards applicable.*
>
> (CEC,1991).

2.1 Background to the Environmental Audit (EA)

Environmental audits were first carried out by private firms in the USA for financial and legal reasons, as an extension of financial audits, in the past decade they have been increasingly carried out by private consultants.

In response from public pressure to be 'green' local authorities have focused on producing more comprehensive Environmental Audits involving review of transport systems as well as the physical environment. As more and more environmental audits are carried out, they will provide increasing levels of information that can be used to monitor environmental polices.

Generally, environmental audits are seen as part of an environmental management system that includes the formulation of an environmental policy, establishment of an

environmental management programme to achieve the policy, and testing of the adequacy of their implementation through an environmental audit.

2.2 Types of Environmental Audit

There are generally two broad types of environmental audits, these are:-

2.2.1 Industry-Environmental Auditing

Environmental audits carried out by private sector firms vary widely depending on the purpose of the audit. They include acquisition/divestiture audits, which test environmental liabilities that could arise from the purchase or sale of a company; risk audits which consider safety and occupational health; compliance audits, which test compliance with relevant environmental and safety standards; corporate audits, which consider the workings of the entire organisation; and associate audits, which assess subsidiary or supplier companies.

2.2.2 Local Authority-Environmental Auditing

Local authority environmental audits have taken a more consistent format than those of the private sector, primarily because they all aim to do the same thing: provide information on baseline conditions in the relevant area, and suggest ways in which the local authority could change its operations to become 'greener'.These audits include several factors, in varying levels of depth:-

- A State of the Environment Report which reviews baseline environmental conditions in the area, preferably in conjunction with a regular updated environmental data base.

- A policy impact assessment which evaluates the local authority's polices and practices and suggests actions to improve matters where necessary.
- An environmental management system like those of private firms, to implement, monitor and review the audit findings (Selman 1992).

2.2.3 Standards and regulations on Environmental Auditing

Two recent developments in environmental auditing standards and regulations are likely to have repercussions in terms of the number of audits carried out, their quality, and the public availability of audit results: British Standard 7750 on Environmental Management Systems of early 1992, and the proposed EC Eco-Management and Audit regulation, which was agreed in early 1993. Fulfilment of BS7750 entails the following steps (Glasson 1994):-

- Commitment by the organisation to undertake the audit.
- A preparatory review and assessment of relevant regulatory requirements, environmental effects, environmental management practices and procedures, and feedback from investigations of previous incidents and non-compliance formulation of an environmental policy.
- A full inventory and assessment of whether the activities conform to relevant regulations and requirements.
- Formulation of targets and objectives.
- Development of an environmental management programme and supporting manual application of the management plan in the organisation's operations and record keeping.

- An audit to test whether the organisation achieves its targets and objectives, which feeds back into environmental policy to form a cycle.

2.3 State of the Environment Report (SoE)

The State of the Environment Report (SoE) represents an attempt to provide an accurate and comprehensive profile of the status of environmental components, water/air quality, landuse, fauna, flora, travel and transport patterns (the last two factors usually depend on the specifics of the area) at regular intervals. SoE Reports analyse and interpret trends and conditions in the environment, and identify developmental pressures likely to alter environmental quality and resource availability. At first these reports were rather piecemeal and only involved looking at specific areas, like water or air quality. One of the first comprehensive SoE Reports to include the whole environmental spectrum of factors was completed by Kirklees Council (1986). Typically the benefits of SoE reporting are threefold:-

- It increases public awareness about the conditions of the environment, the effects of human activities on it and the implications of environmental change.
- It enables decision-makers to define problems, establish priorities for action and identify yardsticks for measuring progress.
- It can promote sustainable development through the better management of environmental resources.

As well as providing information on an integrated basis, inter-departmental collaboration is facilitated by the administrative framework which draws together the

activities of many departments. In addition a public advisory committee, comprising representatives of environmental, industrial and academic bodies make recommendations to the government with a view to ensuring that the SoE reporting is up to date.

2.4 Environmental Auditing in Durham City

As part of the study for the Client, environmental auditing of Durham City's green spaces was carried out. Although the study is in part environmental audit it is also an SoE Report.The reason for this is that a bank of baseline data has also been collected, as well as reviewing management systems of green space landuse.

3.0 METHODOLOGY

The Client, required an overview of the city's green spaces (**see map, Fig 3.1**).This study area, included all of Durham City as well as Framwellgate Moor, Newton Hall and Pity Me, (Newton Hall in the north to Great High Wood in the south -a distance of approximately 4 kilometres and Darlington Road in the west to Sherburn Road Estate, Gilesgate east of Durham City -a distance of 3 kilometres).

Parcels of green space land were investigated in the city area.These sites were categorised into different land uses (**Fig 3.2**). The land owners were contacted and interviews were arranged, landowners included, Durham City/County Council, University of Durham and private owners, Mt Oswalds golf course and Mr Hopps, farmer and owner of Gilesgate field.

Data for environmental conditions varied in availability and in quality. Important data sources for most of the green space locations came from statutory development plans, (Local Plans and Structure Plans)- these provided useful information on the physical, social and economic environment. Data for fauna and flora records came from interviews and was supplemented with published data from the Environmental Agency (EA) and the Durham Wildlife Trust (DWT).

An assessment was made of the importance of the green spaces, both as an asset to the city, visually and as a useful resource, either for the public, wildlife or both. This involved observing the green spaces at different times of the day and through different months to discover popularity of the site, amenity value and public reaction. Other factors were also looked at, noise pollution, pH, wildlife potential, an assessment was made of rubbish, vandalism and other signs of misuse.Management of the sites was

Green space landuse type : 1 — **Woods**

1. Hoppers Wood : (DCC) , Mr Leach, Frankland Farm * (NZ 275440)
2. Pelaw Wood/Pelaw Wood Beck : (DCC)* (NZ 286424), (NZ 286425)
3. Hollingside Wood : University of Durham * (NZ 275405)
4. Shaw Wood/Flass Vale: (DCoC) * (NZ 265427), (NZ 263426)
5. Great and Little High Woods : Durham University * (NZ 279409), (NZ 275413)
6. Houghall/ Maiden Castle Woods: Dean and Chapter/Durham University * (NZ 282406), (NZ 284418)

Green space landuse type : 2 — **Cemeteries**

7. St Oswalds and Stockton Road site : (DCC)/ Dean & Chapter* (NZ 276419), (NZ 278417)
8. St Nicholas : Dean and Chapter/ (DCC) * (NZ 276429) *
9. St Margarets : Dean and Chapter/ (DCC) * (NZ 270423)*

Green space landuse type : 3 — **Parkland**

10. Wharton Park : (DCC) * (NZ 269429)

Green space landuse type : 4 — **Recreation/Sports**

11. Graham Sports Centre : University of Durham * (NZ 286415)
12. Mount Oswalds golf course : Privately owned (NZ 266406)

Green space landuse type : 5 — **Schools grounds**

13. Durham Johnson (upper) school : (DCoC) * (NZ 261428)

Green space landuse type : 6 — **Public/private common land**

14. Elvet Sands : (DCC) * (NZ 276431)
15. Gilesgate Green Palace Green (DCC) * (NZ 286427)
16. Gilesgate Field : Richard Hopps * (NZ 295422) Old Durham (NZ 289419)(NZ 275423)
17. Pity Me Carrs : managed by Framwellgate Moor parish council, (DCoC) * (NZ270450)

Green space landuse type : 7 — **University/Estates and Buildings land**

18. Botanic Gardens : University of Durham * (NZ 274409)
19. Miscellaneous landscaped land around the library and departmental buildings, University of Durham * (NZ 276415)

Green space landuse type : 8 — **The River Banks/River Wear**

20. The peninsula/river banks : Dean and Chapter/University of Durham * peninsular, (NZ 273421)

Green space landuse type : 9 — **Urban green space**

21. Low Newton Junction, nature reserve, Newton Hall : (DCoC) * (NZ 282448)
22. Allotment gardens : privately owned (Margery Lane NZ 269421)
23. Green corridors,widespread : (DCC), (DCoC) *(Potters Bank, NZ 270416)
24. Landscaped areas (including roundabouts) in Durham City centre : (DCC)* Framwellgate Peth car park NZ 271428)
25. Street Trees and verges,widespread around Durham : (DCC)/(DCoC) * (New Elvet NZ 277421)

Green space landuse type : 10 — **Vantage point/views/hills**

26. Windmill Hill : (DCC) * (NZ 270411)

* referred to. * owned by. (DCC) Durham City Council. (DCoC) Durham County Council

Fig. 3.2 Green space landuse types studied in the Durham City area

studied and changes to management techniques were suggested with a view to saving costs, time, manpower and materials.

Information was obtained from various sources in order to suggest recommendations for future management. This information included current management plans, mission statements, copies of old contracts, mowing regimes information on machinery, technical data and maps.

A Noise and pH survey was carried out as part of the study. Both were done consecutively on the same days. The noise survey was carried out using a CEL-368-Type 2 Environmental Noise Meter to discover if noise affected green sites and then suggest mitigation recommendations. The surveys were both carried out using a current Ordnance Survey map of the study area and a grid with 60 point references marked every 500 metres (**see Appendix 15**).

The pH measurements were carried out using a standard pH 'probe' meter. This survey was undertaken to try to discover the acid/alkali range of the study area (**see Appendix 15**).

A visual assessment was made of rubbish, fly-tipping or large scale dumping on green spaces in the city.

A small project was also undertaken within the study, to suggest ideas/plans for improvement to a part of Durham Johnson Upper School grounds (Grid Ref NZ 261428), specifically the pond and wildlife garden. The area of land consisted of a small wildlife garden and pond adjoining the science labs. The garden, had become overgrown with ragwort, dandelion and Yorkshire Fog, by cutting the grass back and planting native shrubs and wild flowers this site could be turned into a study area for

Biology lessons etc. This project arose after consultation with the school's science teacher, in which she expressed concern for the wildlife garden and pond suffering neglect.

3.1 Green space planning in cities

The preservation of open space is a crucial element in any plan, over the years despite tremendous development pressures planning authorities have sought, with considerable success to preserve the'green belt' concept of keeping some open land between towns and cities. Likewise local authorities have also made provision for open land within towns and cities this land is often difficult to categorise, on the one hand it is not particularly parkland, nor is it genuine countryside, it may be common land in the historic sense, or simply land that is informally maintained for the enjoyment of people who live nearby. In recent years the development of this land into recreational green space has occurred, for example. Bridle paths for horse riding and cycling or parkland golf courses and common greens for general activities.The local planning authority will usually conduct an appraisal of open country that is available (or can be made available) to its citizens. Some of the specific open country uses like golf courses and riding schools conserve the green openness, but specifically reduce accessibility. So the authority will develop a heirachy of open space provision and availability, some being for general use.Others for sporting provision and availability and others providing peace and seclusion by being allocated to quieter pursuits like walking or birdwatching.

Similarly but different in terms of public accessibility, are the wildlife habitats that need protection.They often conflict with the development demands of industry or

leisure. Likewise there is a need to protect landscapes that have matured over centuries.

In developing their open space policies all planning authorities always have to balance the demands for development (and the economic benefit that may bring) against the need to provide an attractive environment by not over developing. Once it is satisfied that it has that balance right it can make provision for the different kinds of development needed and the enhancement programme that all urban areas need (Selman 1992).

3.2 Durham City/County Council - green space management

In Durham City, £1.2 million is currently spent on grounds maintenance, open spaces and housing estates.Council spending on the environment is already a substantial operation, but the financial climate in which the Council must work is liable to change year by year (Jackson 1997).

The division of Durham City Council that manages green space within the city is the Amenities and Leisure Services. This division provides a varied and important range of services for residents and visitors to the City of Durham. It includes the development and maintenance of parks and open green spaces, trees and woodlands, outdoor sports facilities, children's play areas, allotment areas, provision of burial services and management of cemeteries turned over by the church. Amenities staff also act as consultants on horticultural, aboricultural and landscape provision and management to other departments of the Council.

A key role of the division is the support given to promote the improvement of the environment through the 'Beautiful Durham/Britain in Bloom competitions (see

Appendix 3). These are undertaken in co-operation with local residents/businesses and other groups in the city, such as the Dean and Chapter, University of Durham, Parish Councils and the Durham Wildlife Trust. Throughout the district Durham City through, its amenities division has over the past few years earned regional and national recognition for its floral displays, winning the 'Northumbria in Bloom' 'Best City Award' three times and twice winning 'Best Overall Entry Award' since 1990.

A five year tree survey inspection of the cities trees is being undertaken inconjunction with Houghall College and the City Council. The survey, (started in 1997) is to determine the condition of the trees and the type of maintenance each requires. The long term management proposal is to ensure continued tree cover throughout the city.

The County Council is responsible for the grounds maintenance of approximately 1,200 sites and locations throughout the County Durham area.

3.3 Compulsory Competitive Tendering (CCT) and the Local Government Act 1988

Over a significant period, local authorities were prepared for the need to organise the management of parks and leisure facilities on a more competitive basis. When the Local Government Act (1988) became law at the end of March 1988. It introduced to landscape management some large changes.Traditionally Local Authorities had undertaken their own landscape maintenance work, using an 'in-house' direct labour force. The Act has in effect forced local authorities to bid competitively for their landscape work in the open market, thereby giving appropriately experienced landscape contractors an equal chance of undertaking the work.

As a consequence the landscape management activities of Local Authorities have had to be split into client and contractor roles, because there is no guarantee that the in-

house team would win tenders (Jackson 1997). The section of the Authority, responsible for performing the client role, plans the work to be done and presents it in the form of a tender document. Having been appointed, the successful contractor is paid the contract rate for the job regardless of the resources actually used in undertaking the work.

The act requires that every local authority will put out to tender at least 20% of their total landscape management work on or before 1st of January 1990, followed by another 20% each year after until eventually all public amenity work has been in effect privatised. It is expected that under the Act some direct labour forces may become quite small and that larger contractors will develop to take their place. The actual outcome remains to be seen, most probably it will result in the market being dominated by a mixture of both efficient private contractors and highly-motivated Local Authority 'contract' teams'(Cobham 1990). The horticultural and grounds maintenance services required by the Council can be seen (**Figure 3.3**).

3.4 Local Agenda 21

Local Agenda 21 is sustainable maintenance, restoration and development of values of nature and landscape and so is important for the development of green space in Durham. Maintaining the natural diversity of wildlife and management of these areas are also key issues, to do this the County Council have appointed a Local Agenda 21 team to assist and give help and advice to environmental projects in Durham (M .Bosanquet 1997).

Agenda 21 is the realisation of the 1992 Earth Summit in Rio de Janeiro when 189 world leaders met to discuss the future for the Environment. The outcome was Agenda 21, an agenda for sustainable development for the 21st century. However

sustainability can only be achieved if every local community around the world is involved- hence *Local* Agenda 21.

Summer work	**Winter work**
Planting of bedding plants and bulbs	Renovation of grass areas
Grass cutting	Planting of trees, shrubs and other plants
Grass edging	Pruning of shrubs and roses
Grass clearing	Leaf clearing
Hoeing and weeding	Weed killing
Hedge cutting	Edging
Maintenance of planted beds	Aeration and top dressing
Sports facility marking	Cultivation of planted beds
Preparation and maintenance of specialised sports facilities	Hedge cutting
Maintenance of synthetic,	Sports facility marking
hard porous, sports play areas and recreational facilities	Seasonal maintenance
Fertilising and chemical weed control	
Seeding of grassed areas	
Collection and removal of litter and general rubbish	

Fig. 3.3 Horticultural and grounds maintenance services required by the Council.

4.0 GREEN SPACE LAND CATERGORIES IN DURHAM CITY-MANAGEMENT AND FUTURE RECOMMENDATIONS

4.1 The city environment

Green spaces in cities are extremely varied, both in terms of landuse, plant and animal species and also in their functions, the following chapter illustrates this for cities in general and Durham City in particular.

4.2 Peripheral green space in cities (Grid Ref NZ 276426 - Leazes Road)

4.2.1 Background

The type of continuously built-up environment considered in most cities as dense urban complexes is not typical of Durham, but it does share similar 'city style' features, streets, pedestrian precincts, squares, courtyards and car parks.These areas are not usually thought of as green space land but can be invaluable in making a city blend in to the surrounding countryside and providing it's residents, both animal and human with a more harmonious place to live.

City landscapes are usually made up of two components. These components are known as hard and soft landscape. Hard landscape in a city usually means the buildings, carparks, roads and streets.Soft landscape is mostly confined to the curtilage of buildings, raised planters, tubs, window boxes and street trees though occasional communal gardens may be present.

The bulk of the vegetation in cities is composed of planted ornamental species ranging from forest trees to collections of annuals in window boxes. These small scattered islands of green are characteristic of most city soft landscape. In its

openness, instability, highly discontinuous character and wide range of growth forms the vegetation found in cities has similarities to that found on cliffs as they are both similar environments, i.e. little nutrients, inaccessible and exposed.

In cities the climate is usually increased in temperature from the surrounding countryside, air pollution and dust, and a decline in humidity are also characteristic. Soils are highly variable with regard to depth and texture; at ground level they tend to be eutrophicated, drought prone and compact.

4.3 Natural vegetation in cities (London -a case study)

Well-defined communities of spontaneous natural vegetation do penetrate at the heart of cities.One of the clearest demonstrations of this wild flora is the study of central London carried out by Hadden (1978) who recorded 157 species in the small (<4 km squared), heavily built-up tract of the city covered by postal district W1.

Hadden found that the habitats where plants occur, could be grouped roughly into three types.The first, 'cultivated sites', included gardens, window boxes, raised planters and tended soil at the base of the trees.The second, 'uncultivated sites', these were mainly building sites used as car parks.The last 'stonework', included pavements, roads, cobbled mews and walls.

The majority of these plant species have seeds adapted for wind dispersal but are also picked up on the feet of birds. Hadden's study found that some species were totally unexpected, such as knotted hedge-parsley (*Torilis nodosa*), found at the footings of a church (the nearest population is in the grounds of Buckingham Palace), burnet saxifrage (*Pimpinella saxifraga*) in a lawn, and lesser spearwort (*Ranunculus flammula*) in a flower bed and garden escapes (*Lobelia erinus, Lobularia maritima,*

Oxalis corniculata and *Petroselinum crispum*) around precincts. The study shows that city vegetation is dynamic and changes from year to year (Gilbert 1989).

4.3.1 Natural Vegetation in Durham City

In cities the most well-defined and stable community of town centres is found colonising the joints and cracks in paved surfaces, away from the main walkways, where the vegetation has had a chance to establish itself. The severe environmental conditions, particularly trampling, make for a simple structure and low diversity but the harshness of the habitat is somewhat tempered by the soil which though compacted, tends to be highly fertile. During investigation, species recorded inhabiting this type of habitat in Durham, South Bailey, (Grid Ref NZ 274419) included, *Poa annua, Sagina procumbens, Plantago major, Taraxacum officinalis (agg.), Polygonum aviculare, Capsella bursapastoris, Lolium perenne* and the bryophytes *Bryum argenteum* and *Ceratodon purpureus.*

In very heavily trampled sites around Durham centre, along Crossgate, (Grid Ref NZ 279424) an impoverished community exists consisting of *Poa annua, Plantago major, Sagina procumbens* and *Byrum argenteum.* Where sites are less disturbed such at the base of walls and lamp posts, or in courtyards and serviceyards, a wider range of species was recorded including many nitrophiles, *Stellaria media, Matricaria matricarioides, Chenopodium album, Artemisia vulgaris, Sonchus spp., Hordeum murinum, Galinsoga parviflora, Buddleia, Epilobium angustifolium.* Periodically many of these plants are killed with spraying or are weeded but sufficient survive to provide the major seed reservoir for these species to survive in the city.

Other variation in vegetation within the city can be seen in sites with micro climates,

for example, near pipe overflows, below leaky gutters where the environment is moist. On Sherburn Road (Grid Ref NZ 290427), thallose liverworts *Lunularia cruciata* and *Marchantia polymorpha*) were found along overflow drainpipes. A sign that sites are relatively undisturbed is the appearance of nettles *Urtica dioica, U.urens*.The range of microhabitats in a city makes for the unexpected (Jackson & Skeffington 1984) recorded a temporary population of lentil (*Lens culinaris*) and chickpea (*Cicer arietinum*) outside a health-food shop, an event which is entirely explicable.

A different urban habitat is provided by the sunken areas in front of houses which allow light to reach basement windows and pavement coal-hole shafts covered by gratings. These sheltered, moist, often frost free niches can support unusual ferns. Bracken and male fern are the commonest but several others such as lady fern and hart's tongue fern are reasonably frequent in the north and west. Occasionally ferns, the spores of which have originated from indoor cultivated plants are found, for example maiden hair fern (*Adiantum capillus-veneris*) was seen growing in a sheltered corner of a garden on Flass street (Grid Ref NZ267426).

4.4 Current Management

Durham City's standing as a World Heritage Site means that the city is maintained to a high level. Flower displays, beds, tree planting and grass cutting must follow strict management procedures.

In the city, flower beds, tubs, window boxes and hanging baskets are planted with a conservative range of short-lived ornamental species selected for their extended flowering season and an ability to thrive in dryish soil. Flower beds, tubs, window boxes and hanging baskets can be found in and around Durham City and are

maintained by the Amenities Department of the City Council, species used include, Daffodils, *Narcissus pseudonarcissus, Acanthus* spp., *Anemone x hybrida, Nepeta, Polygonum and Geranium* spp. Apart from the flowers providing nectar and pollen source for common insects and the foliage supporting occasional larvae of widespread moths, these plants only play a minor role in the city centre ecosystem.

4.5 Planted Displays in Durham City

Planted displays are an expensive but highly appreciated feature of the more intimate and urban landscape (**Figure 4.1**). In Durham City Centre most of the displays, (some are changed monthly) are designed one year before planting.

Fig. 4.1 Planted display on the roundabout near Mount Joy (Grid Ref NZ279417), Durham

There are currently (1997) 35 full-time gardeners and twenty part-time workers involved in managing and Maintainance (Pers. Com, A . Jackson). Bedding displays usually constitute a large amount of budget money available to the Council as between 50-60,000 bedding plants are used each summer. As staff receive instant praise and appreciation from the public, it is not too difficult to achieve maximum staff identification with the success of the planting and craftsman ship attained is often of a higher degree than with that of any other feature. Mass planting (planted displays) of close-spaced biennials and perennials to form floral carpets is expensive for three reasons:-

- The plantings are changed frequently: at least bi-annually and on occasions three times or more per year. They are therefore expensive in terms of raw materials. The cost of either producing or purchasing plants for frequent plantings is a significant proportion of total bedding costs.
- The plants are normally massed at very close spacings, in order to form a carpet effect quickly. This entails the use of a lot of plant material per unit area. Planting time is extended because of precise spacings and geometric designs which require marking out.
- In order to be effective, bedding needs a high level of both husbandry and management. Traditionally these are characteristic of the 'gardenesque'era, involving preparation of a fertile, well-structured planting bed, through weed control and effective irrigation, in order to obtain maximum performance from the plants in a short time.The formal planting designs

mean that even a very small weed cover looks out of place and is intolerable.

Spring bedding, planted from mid-May to early June, consists of hardy, tender and even tropical perennial species. Standard and dot plants are often tender perennial plants which need arrangements for returning to base for overwintering care. It is prohibitively expensive to start again each year with sizeable plants of *Cordyline indivisa* or *Agave americana* 'Variegata'. In Durham, the main groundwork planting consists of annuals, biennials, perennials.

4.5.1 Continuously-flowering bedding plants

Continuously-flowering bedding plants flower continuously until cut down by the early winter's frosts, e.g. fibrous rooted begonias or the modern *Impatiens* spp.

4.5.2 Bedding plants flowering in flushes

Examples of bedding plants which flower in flushes are the *Antirrhinum majus*. If these plants are overfed with nitrogen they may be out of flower more often than in flower.

4.5.3 Bedding plants used for their foliage

Bedding plants used for their foliage may flower but are used more for their leaf colour and/or form e.g. *Pelargonium* 'Little Trot' or *Echeveria secunda* var. *glauca*. Both these plants are tender perennials and require glasshouse protection in winter. Bedding plants are used for their foliage and tend to be subtropical species.

4.6 Planted Areas -General Management

In developing a landscape scheme, the designer should liaise closely with the Client to

establish the range of landscape elements that will be needed to successfully fulfil the design brief.

The designer in his preliminary studies should among other things, take into account the maintenance resources in terms of time, skills and money that are available, and should design so that the brief may be fulfilled within the framework of these resources. If the Client requirements are likely to result in a need for skills and maintenance funds beyond those which exist, this should be made clear and agreement reached on the way in which the increased maintenance implications are met, or an alternative chosen (Cobham,1990). For example, the client may, in asking for a shrub border near a building, set a brief for it to have flowering shrubs over as long a period as possible.To maintain such a border in good condition and to ensure this, reasonably skilled pruning will be required several times per year, depending on the flowering season and habit of the shrubs that would have to be used. The designer should draw attention to the increased maintenance requirement and if necessary, offer an alternative scheme with a range of shrubs that may flower less, but which would also need less pruning.

Once agreement is reached on the styles of design that will fulfil the brief, the designer should prepare drawings and specify construction in detail so that the grounds maintenance manager's task in developing the scheme to the designer's envisaged state of maturity is a practicable proposition. It is also good practice for the designer to provide the manager with a landscape development manual, setting out in detail the requirements for the management of the site including the thinning out of groups of trees, removal and addition of plantings, etc., so that the scheme fulfils the

design brief.Where there are areas with vegetation that are vulnerable to over-use, they should be either fenced off or more subtly screened by using a barrier of impenetrable vegetation:-

- Fostering barriers of thicket-forming native plants such as gorse, bramble and quick thorn;
- Planting areas of dense branching thorny shrubs such as *Berberis* and *Rosa* spp. , and *Poncirus trifoliata.*

Car parks should be sited in such a way that the least harm is done, visually and in terms of wear, to the landscape features of the site. This may mean siting the car park some distance from the main landscape amenity and allowing access only.

4.7 Plants in containers- General Management

Plant containers are most commonly used in urban areas, where air pollution, especially traffic film from vehicles, is exacerbated by glazed buildings, draughts, rainshadow, low humidity, and rapid fluctuations of temperature.The plants contained have to suffer small root runs, the deposition of litter and damage caused by dogs and vandals. Containers should not be set under overhangs, or near hot air or fume outlets, in deep shade, or in areas subject to wind acceleration through or between high buildings. Plants for semi-permanent plantings should be chosen from lists containing species tolerant of the above, often extreme conditions.

Containers should be of concrete, wood, slate, etc and should have ample strength to contain wet heavy compost for long periods. Precast concrete pots should have the reinforcement treated with a rust inhibitor before manufacture, as the pots are exposed

to water containing corrosive salts, i.e. fertilizer, and this has been observed to cause, in some cases, rapid rusting, expansion of the metal and spalling of the concrete. As a precaution all containers, no matter of what material, should be lined with three coats of a reliable damp-proofing bitumen paint, even if a liner is to be used. Drainage should also be adequate (Cobham 1990).

4.8 Street furniture

Street furniture in cities includes benches, litter bins, lamp posts, hanging baskets and other plant containers.The design of the location of fixed items of furniture and equipment can affect the costs of maintenance in the following ways:-

- By the way it directly interferes or does not interfere with the maintenance operations on adjoining areas;
- By the way it influences the use by the public of the area concerned;
- By the way the maintenance of the furniture or equipment itself is made easier or unnecessary difficult by reason of its location.

Note the siting, (for example of seats, playground equipment and sculptures direct on to the grass areas) will cause heavy wear and should be avoided if possible.

A common example:-

A seat permanently fixed with its back to a hedge. Maintenance of the hedge is made more awkward and access to the rear and the underneath for cleaning or painting will be very difficult.

4.9 Gardens

There are 400,000 hectares of private gardens in Britain. A substantial proportion is in towns and cities (Gilbert 1989). Gardens make up large areas of green space in cities

and can also be part of green corridor networks.A garden can easily be designed and managed to encourage wildlife. Urban gardens, particularly older ones do a great deal to encourage wildlife, foxes, hedgehogs, newts and woodland birds are familiar examples but gardens can also support a suprisingly large number and diversity of insects and other invertebrates.

4.10 Grass verges (Grid Ref NZ 276426 - Leazes Road)

About a quarter of urban roads are designed to have grass verges. Roadside verges and particular motorway verges are one of the few habitats that are increasing rather than decreasing in area. Most verges are regarded as an urban 'hard shoulder' rather than a landscaped area, but this is not necessarily the case and roadside verges, can be seen as important green spaces in their own right. The importance of motorway verges was increased by the protection afforded by the limitation on the rights of public access.Verges have been studied extensively by (Way 1969) and the effects of herbicides on verges have been studied by (Willis 1985).

4.10.1 Current Management of grass verges

Each stretch of roadside verge is likely to possess features peculiar to that site and usually it is not possible to produce a specific plan for road verges, but a generalised plan is possible.

Guideline specifications are set down as to manage roadside verges. The normal method of establishment is to use topsoil together with a rye-grass based seed mixture. Mowing 6-10 times a year prevents long grass accumulating and promotes tidiness.

With mowing and other factors such as drainage, slope and usage, plant species are very variable. Frequently the sown species persists for a long time as the fertility and height and frequency of cut are ideal for perennial ryegrass; however disturbance levels allow in a regular component of weedy species. Where pronounced soil compaction occurs, where people walk on the verge or cars are regularly parked there, plants that thrive under conditions of slightly impeded drainage become prominent, e.g. rough-stalked meadow grass (*Poa trivialis*), creeping buttercup (*Ranunculus repens*), creeping bent (*Agrostis stolonifera*) and greater plantain (*Plantago major*). Trampled verges and verge margins beside pavements have much in common with heavily used lawns, often containing large numbers of rosette and mat-forming species. Along the road margin, disturbance is often sufficient to maintain bare areas; here an international community of trackside species can be found comprising shepherd's purse, knotgrass, pineapple weed, annual meadow-grass and greater plantain.

Roadside verge soil where there is less human activity, is characteristic of better soil structure and a higher organic content than areas which may adjoin verges, particularly agricultural areas that may be compacted by machinery where the effect of cultivation is to reduce earthworm numbers and to destroy the soil structure -associated with permanent pasture land.

Possibly a combination of improved structure and higher organic content has improved the buffering capacity of roadside verge sites. The use of salt for de-icing of roads during winter may cause increases in the levels of sodium present and changes in the pH of roadside verge soils (Davidson 1971), particularly where the soil is shallow or drainage is impeded.

4.10.2 Future Management of grass verges

Management of each verge has to take in to account, difference in soil type, soil pH, vegetation, geographical orientation, physical construction, area of the verge, the presence or absence of trees, paths, ditches and banks and the type of boundary present.

4.10.3 Recommendations

Current and future management of verges should include the following recommendations:-

- In many instances the avoidance of exclusive cutting alongside the road edge is sufficient to ensure that sites of interest maintain their conservation value. More specific treatment of sites is likely to improve impossible and may depend on the individual verge unless it is carried out by voluntary organisation since it may prove difficult in practice to ensure that even the simple guidelines are adhered to by local authority personnel.
- Extensive cutting should be restricted to a narrow, roadside strip, 1 metre in width.
- There should be a zone adjoining this that is less frequently managed with only one or two cuts per year.
- The zone of less extensive cutting should be cut at a time which allows interesting plant species to flower and set seed.
- Vegetation should be cut to circa 15cm and skids or rollers should be fitted to prevent the cutter from creating bare patches of soil.
- Use of herbicides should be restricted to localised applications.

4.11 Management of roadside verges by local authorities

Economic cost often restricts the cutting of roadside verge and in some instances the low levels of verge maintenance fortuitously coincides with the recommended management for the site.

In general many verges are left uncut except for a narrow strip of 1 metre at the edge of the carriageway which is maintained to a height of 15cm. Such a management regime is not necessarily unfavourable to the conservation aims at some sites. In practice the actual width of cut varies depending on the views of the Council and landowners and can also depend on the contract operators.

Road verges in Durham are cut according to their class, with roads used frequently by the public being awarded class 1 status, these road verges have high maintenance standards and are cut often. Class 2 roads or 'B'' roads are cut less often.Usually the verges are cut in the first half of the year and cutting usually ceases by June. Outside of Durham City, verges are left uncut as it is uneconomic, time consuming and usually unnecessary.The time of verge cutting is dependent upon the availability of men and machines and the requirements of the Local Council. Although cutting is usually limited to a zone alongside the road, in some areas the verge may be closely mown from the road to the verge boundary. Such treatments are carried out particularly in urban areas (**Figure 4.2**).

Use of herbicides by Durham County Council in verge maintenance in Durham City is limited, mainly because applying large applications of herbicide is inconvenient for the public and is usually unnecessary.

4.11.1 Future Management

Future management of roadside verges should include the aim the of maintaining the existing flora, increasing the area of particular phytosociological species, (plant communities) and promoting the increase and spread of species considered interesting or visually attractive.

Fig. 4.2 Durham City Council Grounds Maintenance staff cutting roadside verge (Neville's Cross, Durham City)

4.11.2 Recommendations

These are general recommendations made to roadside verges. Many are employed by City and County Councils and recommendations can be found in grounds maintenance handbooks as well as management techniques and codes of practice. Specific

recommendations will depend on the verge that is being managed. Sites may be :-

- Left unmanaged.
- Cleared of encroaching scrub.
- Mown in an appropriate sequence.

The first of these options is applicable to stable, long established communities e.g. acidic upland, grassland or limestone grassland. Little management is required although clearance of encroaching scrub at the perimeter of the site may be necessary. Elsewhere appropriate mowing regimes may be required both by conservationists and by local authorities concerned with safety aspects of road verge management and the visual appearance of road verges.

4.11.3 Cutting Regimes

4.11.3.1 *Height of vegetation*: Way (1969) working on lowland sites showed that a single cut in May allowed vegetation to reach a maximum height of 50.8cm during the growing season. A lower height circa 20-30cm was maintained by a cut in mid-May followed by a further cut in June.

4.11.3.2 *Flowering Time*: From a conservation point of view it would be desirable to avoid cutting during the peak flowering and fruiting periods. Copson (1974) working on road verges in Warwickshire showed that the less frequent the number of cuts the greater the number of plants flowering and setting seed, and if a single cut was made during October only a small percentage (10%) failed to flower and a large proportion (64%) were able to set seed. A cut in June in addition to that in October reduced the percentage of plants flowering and reduced by half the number setting seeds.

Many of the species of interest present on road verges flower during the period June-

August and management should be aimed at avoiding cutting during this period. However a number of uncommon species and a number of visually attractive species (e.g. *Primula veris, Primula vulgaris, Viola spp., Veronica chamaedys, Ranunculus ficaria, Cardamine pratensis, Cardamine hirsuta*) flower early in the year and at some sites cutting would be best carried out during June.

Management of roadside verges is not solely a matter of cutting outside the flowering season since the composition of the flora will also be affected by the frequency of the cutting.The height of cutting is also important since developing plants may remain undamaged by a late cut providing a cutter height of 15cm is adhered to (Durham County Conservation Trust Ltd, Roadside Verges in the Tyne to Tees Area, 1979).

Management regimes represent a complex compromise between the requirements and resources of highway authorities and the interests of conservation. Frequently the management recommended for conservation may also represent a compromise between the need to stimulate the development of a low growing herb rich community and the need to avoid cutting during the growing season. At sites where spring flowers occur the decision on the best time for cutting may also cause difficulties.Detailed information on the effects of different cutting regimes on the composition of different roadside verge flora is scarce and needs to be gathered before specific recommendations are made.

4.12 **Hedges** (Grid Ref NZ 270416 - Potters Bank)

4.12.1 Background

> *The Durham area is rich in ancient hedgerows, these are now starting to be recognised as part of our natural heritage and receive protection.* (County Durham SoE Report,1993).

Hedgerows are usually defined as a more or less continuous line of shrubs along a field boundary and connect areas of green space in cities, and perpetuate green corridors (**Figure 4.3**).

Councils are responsible for planting hedges where necessary and this can be a high profile public relations exercise for the Council, if local schools or community groups are involved. Changes to planning legislation are likely to ensure that proposals to remove hedgerows are notified to planning authorities, as well as providing opportunities for the protection and more active management of hedges. New hedges usually consist of strong hard wearing species such as hawthorn-this is a quick growing plant, requires limited care and will thrive with very limited maintenance, it

Fig. 4.3 Part of a green corridor at Potters Bank (Grid Ref NZ 270416), Durham City- with prominent Hawthorn hedges

is undemanding as far as soil type and from a conservation standpoint provides valuable nesting sites and food for birds. Hedgerow management should be carried out from September onwards.

4.12.2 Current Management

Hawthorn is available in commercial quantities and is the main species used in Hedging in many cities.A difficulty concerning the planting of hedges is that the work is unrewarding to the personnel -bonuses are difficult to earn and there is a lack of incentive for Council personnel engaged in such work: economic considerations also mean that hedge planting is not given a high priority and the quality of saplings varies depending on the time of storage and their initial condition.

The levels of maintenance of hedges are primarily determined by functional and locational considerations; those of rural hedges usually being lower than for more formal hedges in prestigious settings.

The chief maintenance operations consist of :-

- Various methods and frequencies of cutting, including laying and coppicing (Brooks 1975);
- Spraying with growth retardant in certain urban or formal areas as a partial or complete substitute for cutting (Einert 1973);
- Gapping-up (Brooks 1975).

4.12.3 Hedge cutting:methods, frequencies and resource requirements

The methods and frequencies of hedge cutting are many and vary according to the type, age length or area and function of the hedge. Several specialist advisory

publications exist covering both manual and mechanical cutting techniques.The chief techniques are:-

- Annual trimming by hand using shears or secateurs;
- Annual or even more frequent mechanical trimming, for example in the case of privet hedges. A tractor mounted flail or preferably a reciprocating cutter is appropriate for rural and large-scale projects. Lighter duty hand-operated machine cutters are more appropriate for smaller scale urban sites. (An example of sympathetic environmental management, in Durham, used by the Botanical Garden, Dean and Chapter and the University grounds staff is leaving cutting until September, in order to protect birds nests and fledglings).
- Periodic facing back of older and taller hedges either manually or mechanically. Where the vegetation to be cut is 3 years or more old, a shape saw is preferred.
- Rotational coppicing of species which freely regenerate from the stubs using a mechanically-powered shape saw.
- Rotational laying and layering. The system best adopted for pruning a particular species of hedge plant depends not just on it's growth rate but also upon the formality, or otherwise, of the plant and the desired hedge, and the lateral spread of the plant. The timing and frequency of the cut depend on aspects such as whether the hedge is to flower and how it tolerates hard cutting back. Foliage type is also important: deciduous species are usually cut in winter, evergreens in spring so that new growth can rapidly cover the cuts.Growth habit and frequency of cut can also affect

the ease of maintenance and hence the time inputs required. Rural hedges composed of native species are typically cut much less frequently because the finished appearance is less important. The most common method of rural hedge cutting now involves using a tractor-mounted flail arm (Cobham1990).

4.12.4 Future Management

Traditional methods of hedge laying are appearing again in some parts of the country. Specialist craftsmen are increasingly available to undertake this work, as well as members of volunteer groups.

Increasingly certain growth retardant chemicals have proved to be extremely effective in reducing the need for hedge cutting in urban areas. Dikegulak - a chemical which is normally applied as a foliar spray is used as a growth retardant on woody plant or hedge growth. Dosage rates and the number of applications per year depends on species: normally one or two applications annually are sufficient to reduce the annual need for hedge cutting by up to 50%, depending on the previous cutting frequency. The chemical itself is relatively expensive (£38 per litre,1983), but it's use can be readily justified by reductions in labour requirements. Although all herbicides should be used sparingly and with respect to the environment.

4.13 Green Corridors (Grid Ref NZ 270416 - Potters Bank)

Green corridors are a valuable characteristic of the local environment, providing green buffers between neighbours and a landscape framework for built development.Green corridors enhance recreation opportunities by providing extended routes for walking and cycling and they are especially important for wildlife allowing migration of plants and animals from the countryside through the urban area. Linkages of open spaces into

continuous corridors gives added value in terms of amenity, nature conservation and recreation, particularly where the corridor penetrates from the open countryside deep into or through the urban area. Green corridors can be described as areas of linked greenspace.They are supported by the department of the environment in both planning policy and regional policy guidelines. Planning policy guidance 9 (PPG 9) paragraph 15 states :-

- *Statutory and non statutory sites, together with countryside features which provide green corridor / wildlife corridors, links or stepping stones from one habitat to another, all help to form a network necessary to ensure the maintenance of the current range and diversity of our flora, fauna, geological and landform features and the survival of important species.*

Regional planning guidance for the northern region, R PG 7, paragraph 3.6.States :-

- *Green corridors/wildlife corridors, which link sites together and encourage the movement of plant and animal species throughout the region should be identified, monitored and protected. In Durham City these should link up with other parts of the Durham area.*

This is embodied within the review of the County Durham structure plan. Support is also given to wildlife corridors in the Durham County Nature Conservation Strategy NC55 Land Management states :-

- *Recognising the value of linear habitats such as hedgerows, water courses, road verges and active and disused railways for the purpose of migration and colonisation of wildlife, the County Council will seek to ensure that this network is retained wherever possible.*

4.13.1 Durham County/City Council green corridor policies

Local plans policies seek to ensure that wherever opportunities arise new development contributes to extending and enhancing the corridor network.(development of the Mount Joy site will include a grassland meadow and small lake).The green corridor network is a priority of Durham City and the County Council for management, habitat creation and recreation measures. Green Corridors are identified in Policy 68 of the

County Durham Structure Plan Review (published 1995).

Policy 68 states:-

> - *Strategic wildlife corridors will be consolidated and strengthened. Development within a strategic wildlife corridor should not impair its integrity and where possible should contribute to its nature conservation interest through appropriate landscaping, restoration or management.*

4.13.2 Specific green corridor policies

These local policies seek to enhance and protect green corridors in the following ways:-

- Defining and promoting the green corridor network and creating an identity for it, to provide a focus for the development of detailed management and enhancement proposals.
- Raising popular awareness of interest and support for the green network especially amongst private landowners within and adjacent to green corridors.
- Introducing changes to individual land holdings in accordance with the suggestions to enhance amenity, nature conservation or recreation value of the wider green corridor network.
- Protecting linear habitat and landscaping features in the countryside.
- Resources and effort can be more productive by focusing, wherever feasible on the city's strategic green network, rather than on isolated and unrelated spaces.
- The County and City Councils are major landowners and managers within these corridors, many others ranging from major businesses to private gardens can contribute to their consolidation and enhancement.

- Whilst green corridor areas are characteristic of the urban area, linear features in the countryside are also important for the movement of wildlife, for recreation and landscape features.These include rivers and streams, disused railways, track beds, green lanes and hedgerows.
- Encourage changes to improve amenity, recreation and nature conservation value within the main green corridors, so as to prioritise the allocation of resources to those locations where the resulting benefit will be greatest.

The green network can be consolidated, extended and enhanced in three ways:-

- By securing extensions to green corridors, new landscaping, habitat or recreation provision, or other enhancements to land within existing green corridors in association with new development through the development control process.
- By introducing changes to existing land management practices in favour of sustainable management.
- By incorporating corridor extensions, access facilities, landscaping and new or improved habitats in environmental improvement schemes and partnership projects such as railside revival and river restoration.

4.14 Trees in cites (Grid Ref NZ 277421 - New Elvet)

In County Durham, it has been calculated that 40 trees die or are destroyed every day. The15,000 trees lost each year are more than matched by the County Council's efforts alone to plant trees, 46,000 in County Durham (1987/88). There are 25-30 000 trees in the Durham area, as far as Chester-le-Street. Council policy when planting new trees is to use stake planted 'whips'(**Figure 4.4**) instead of saplings, there are four main reasons for this:-

- Whips are cheaper to buy than saplings.
- Planting whips gives an instant affect of small tree belts, or screening cover.
- They are larger than saplings and usually more robust and usually survive better through the winter.
- Because they give an instant effect of 'always having been there' as opposed to having just been planted, they are less prone to vandalism.

Tree planting in the urban landscape is identified in the County Durham Structure Plan Review, 1995 under Policy 71.

Policy 71 states:-

> *The planting of trees and landscape enhancement particularly in the urban fringes and where it assists with the creation of wildlife habitats and community woodlands shall be encouraged throughout the County.*

4.14.1 Tree Preservation Orders

Before work is carried out on trees, within Durham City, advice should be sought from the local planning authority as to the legality of the work.Trees may be subject to preservation orders, due to historic or aesthetic value, they may also be in

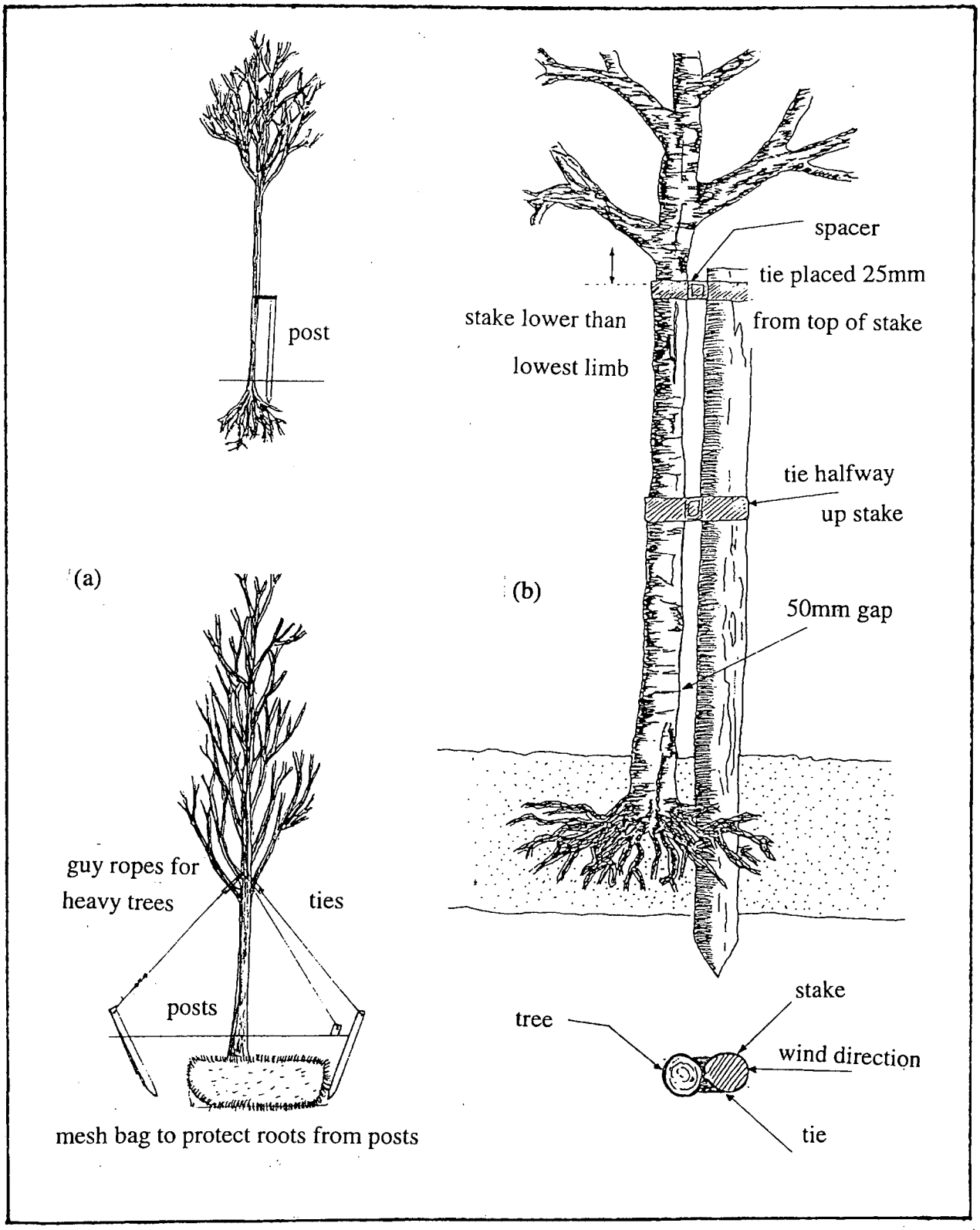


Fig 4.4 Methods of using twin stakes on 'Whips' and saplings in urban areas (a) and details of standard tree planting, staking and tying (b)

Heavy trees should be provided with guys, but where it is not practicable, a heavy oak post 3.2 m long by 90 mm square-section set 750mm into the ground should be used. Ties should be related to the size of the tree. Heavy plastic – impregnated fabric ties with a purpose-made spacer are commercially available, and these can be secured by two large-headed galvanized 25mm nails. Trees should be fixed as close to the stake as possible so that movement is minimized and bark damage eliminated.

Conservation Areas, the local planning authority must be given six weeks notice in writing if the proposed work involves, felling, topping or even merely pruning. The six week notice period enables the local authority to access whether the tree is of sufficient environmental value to warrant protection by a Tree Preservation Order (**Table 4.1**). The local planning authority can also give advice on tree surgery and should be consulted if any tree appears to be in an unsafe condition.The following tree preservation orders were issued by the City Council in the Durham City area (Durham City Council 1993):-

• File No. PN/302	Newton Hall	Date Served 6.1.1969
• File No. PN/309	Mount Oswalds	Date Served 28.11.1972
• File No. PN/310	Flass Vale	Date Served 23.7.1973
• File No. PN/320	Pity Me	Date Served 23.7.1973
• File No. PN/332	St Margarets	Date Served 25.1.1983
• File No. PN/341	Western Hill	Date Served 18.4.1986
• File No. PN/350	Akyley Heads	Date Served 20.4.1986

Table 4.1 Tree Preservation Orders Durham City Council 1993

4.14.2 Street trees in Durham City

Trees pick out major routes in the city and it is the Council's policy to encourage this. Elsewhere the detail of their distribution is largely controlled by such factors as the ideas of the developer, age of the development and width of the verge. Many city trees planted in the past had no attempt to relate species to soil type, altitude or other ecological factors.Their pattern of distribution is mostly chance, though a pattern is seen in cities in the UK that up until about 1950 'forest' trees were planted, after that

date there was a change to smaller ornamental varieties at least in residential areas. Today two-thirds of Durham's trees are forest size and since most originate from the Victorian era or early part of this century they are mature specimens.Their order of abundance is sycamore, ash, horse chestnut, elm, beech, common alder and poplar and native oak (*Quercus petraea, Quercus robur*), (County Durham SoE Report,1993).

In Durham, sycamore (*Acer pseudoplatanus*) has commonly been used as a street tree because of its hardiness. Sycamore displays many of the characteristics of an urban specialist being originally introduced, then a garden escape, with a preference for disturbed fertile soils it is a profolic and regular seed producer.

Highway engineers find that every forest sized tree used for planting in cities brings its own problems. Ash is prone to 'elephants foot', a swelling of the trunk at ground level which lifts footpath surfaces and pushes kerbstones out of line; horse chestnut is usually too large; beech does not grow well after pruning and excludes light; all can penetrate and fracture sewage service runs. Pavements containing mature forest trees require maintenance every 3-5 years those without only at 10-15 years (Gilbert 1989). In Durham a large amount of this work is carried out by the County Council but some is carried out by Houghall College arboricultural students.

The smaller ornamental trees in cities have mostly been in use since about 1950 characterise housing estates in the outer suburbs and environmental improvement areas closer to the centre (**Figure 4.5**).

Initially trees such as Japanese cherry (*Prunus* 'Kazan'), purple crab (*Malus x purpurea*), Japanese crab (*M.floribunda*),birch, rowan and Swedish whitebeam were used. Despite their smaller size these trees also attract a lot of complaints. For

Fig. 4.5 Ornamental street trees, with flower borders, New Elvet (Grid Ref NZ 277421)

example, fruit gets trampled into houses or children use it as ammunition, regular pruning is needed to give the desired 5 m clearance for high sided-vehicles. The City Council are constantly trying new species and cultivars in an effort to find the right tree for each site.

The avoidance of damage to buildings by trees is an important consideration to town planners. On all soils it is inadvisable to plant trees at distances closer to a structure than official recommendations (British Standards, clause 10) allow, for example a tree with a height of over 15m should be planted 1.2m away from a building.An attempt has been made to discover whether the distribution of street trees shows a regional pattern, only 'forest' trees were considered, these normally comprising around half the holding. The results indicate a clear gradient of declining diversity north through Britain. In the south a wide range of trees are employed including hickory (*Carya*), Kentucky coffee bean (*Gymnocladus dioicus*), honey locust (*Gleditsia triancanthos*), indian bean tree (*Catalpa bignioides*), pride of India (*Koelreuteria paniculata*) and many other slightly unusual species. Aberdeen is the poorest town with regard to the diversity of street trees, over 90% being sycamore and lime. Oaks, beech and conifers are poorly represented in this urban habitat throughout the country. The regional pattern is determined partly by climatic and partly by cultural factors (Gilbert 1985).

4.15 Cemeteries and Churchyards

All cities contain cemeteries. These can vary in size from 1 to 50 ha and in age from the second quarter of the nineteenth century to present day.

In the 150 years since the first Metropolitan cemeteries were laid out they have developed a unique ecology related to land use and management. Relic grassland, heathland and woodland often survive within their boundaries, contrasting with the secondary communities of sycamore-bramble-ivy which invade neglected areas. Lichens on stonework, herbicide-resistant communities around kerbs, mown grassland on the verges, gravel in the grave spaces and the now mature structure planting,

together produce a varied but integrated vegetation capable of explanation in terms of anthropogenic factors.

In the past decade there has been a gathering revolution in popular attitudes towards nature conservation, and the churchyard has suddenly come into focus as one of our most important green spaces in cities, in terms of the habitat it provides for a wide range of grasses, mosses, lichens, ferns, fungi, wildflowers, (both native and introduced), insects, reptiles, birds and mammals.The country churchyard is in many parishes virtually the sole surviving remnant of ancient herb-rich grassland, enclosed when the church was built or even earlier.

The very factors which govern the nature of a churchyard, that is, its setting for what is usually the oldest and most significant building in a community and its function as a safe resting place for the bodies of the dead, are the same which provide the necessary continuity and natural respect to allow a wide range of interdependent flora and fauna to develop and survive.

At every educational level, from the primary school to the most advanced university research institute, the resources of the churchyard have begun to be studied seriously, and form the basis of a growing corpus of published work. At the same time many visitors to churchyards can experience the sheer abundance and variety of plant and animal life which can be glimpsed. Churches and their environs are more visited by tourists than ever before, which brings both more pressure on the delicate balance in a churchyard and - on the other hand - more appreciation and enjoyment.

At the same time the countryside in general is under pressure, and frequently all too vulnerable to the effects of a host of official regulations, to the depredations of

encroaching development, and the intensive cultivation of land, using machinery and chemicals. Again in this context, churchyards represent a resource in terms of ancient or long-established grassland, which is both widely and fairly evenly spread across the landscape, and which is relatively (but not wholly) immune to the changes which have affected the secular landscape.

4.15.1 Cemeteries and the Open Spaces Act 1906

A local government act of 1972 enables the church of England to transfer to local authorities responsibility for the maintenance of vegetation, paths and walls in churchyards which have been formally closed. Through this provision an increasing number of city churchyards are being handed over.To reduce maintenance costs they tend to get cleared, levelled, sown, mown and sprayed, which has catastrophic effects on their wildlife.

Under the Open Spaces Act of 1906, local authorities have powers to agree to undertake the entire or partial care, management and control of disused burial grounds to be improved and laid out as open spaces for public use.

Normally where a local authority takes over the full maintenance and control of a churchyard under the Open Spaces Act 1906, the churchyard will not be permanently transferred but will be maintained by the local authority for a set time under an agreement.The Diocesan Registrar should be asked for advice on the form that this should take.Where a local authority aquires control of a churchyard on any basis under the Open Spaces Act 1906, Section 10 of the Act requires it to administer it with a

view to enjoyment by the public as an open space under proper control and regulation:-

> *It must maintain the churchyard in a good and decent state and it has powers to provide proper railings and gates, drainage, turf, planting, ornaments, lights and seats, apart from generally levelling and laying out the ground as appropriate. A faculty will be required for such improvements and should be sought by the local authority.*
>
> (Burman 1988).

Due to the need for local authorities to budget for future commitments, it is normal practice to give informal notice twelve months before serving a formal request on a local authority to maintain a churchyard.Where responsibility for the maintenance of a closed churchyard has been transformed to a local authority before April 1974 under the old law, the future responsibility for its maintenance now rests upon the local authority upon whom a request would have fallen to be served.

It should be stressed that, unless it has been disposed of under the provisions of the Pastoral Measure 1983, a closed churchyard remains subject to the faculty jurisdiction, and even though responsibility for maintenance is transferred to the local authority, it may still be used for church purposes.

4.15.2 Fauna and flora in city churchyards

4.15.2.1 *Trees*- Trees form an indispensable part of the character of a churchyard, for their scale, shade, symbol associations, practical uses, and their beauty. The yew is the tree species most closely associated with churchyards, and the oldest amongst them may well be the oldest living things in Britain, numbered in thousands rather than hundreds of years. Elms, oaks, beeches and limes were frequently introduced from local woodlands; horse-chestnuts, though neither native nor a woodland tree were also

introduced. It seems clear from the character of the trees in churchyards which lie within or on the edge of landscape parks, that in the eighteenth and nineteenth centuries the same care was taken, about the planting in the churchyard as in the park, and similarly, just as exotic trees like cedars and monkey puzzles were introduced into churchyards. Many notable churchyard trees were planted to celebrate local and national festivals and jubilees.

Churchyards were consistently enclosed and it is clear that many trees and hedges around churchyards are very ancient. Well-established hedges usually contain a wide variety of species. The hedges and the mature trees of a churchyard provide necessary shelter for birds, mammals and insects, especially in those counties and regions where woods and hedges are relatively scarce. In addition, there is evidence to suggest that churches and churchyards in prominent positions provide navigational land marks and stopping places for some species of migratory birds (Burman 1988).

Trees are distinguished from buildings in planning legislation.Those in churchyards enjoy no special status. A local planning authority may make a Tree Preservation Order, and where a tree is subject to such an Order it may not, except with the consent of the authority or under certain listed circumstances, be cut down, topped, lopped, uprooted or wilfully damaged or destroyed.The faculty jurisdiction does not provide protection for trees in churchyards in the same way that it does for church buildings and other structures, the permission of the Diocesan Parsonages Board or Board of Finance is required before felling. However the Board's consent is not strictly required for lopping or topping of trees in the churchyard as it is in the case of those on land attached to the parsonage. Therefore secular Tree Preservation Orders can provide

much more substantial protection and it may be desirable for the Parochial Church Council (P.C.C.) to ask the local planning authority to place a Tree Preservation Order on significant trees or groups of trees in the churchyard for the benefit of posterity.The relationship which may be developed with the landscape section of the local planning office may produce helpful advice on maintenance (Burman & Stapleton 1988).

Even when there is not a Tree Preservation Order on a tree, it may be in the interests of good management of the churchyard to seek consent to fell. For example it may be important that mature trees should be felled before they pass their prime and decay sets in. Consent to fell from the local planning authority will usually require planting of a replacement.

4.15.2.2 *Mosses and Lichens*- These are frequently encountered in churchyards. They grow on the decaying stumps of felled trees and in damp and shady corners. The only site for the rare moss *Racomitrium aciculare* so far recorded in Surrey is a grave slab in one of its churchyards.

The astonishing variety of mosses and lichens in churchyards adds greatly to interest on the walls of the church and the enclosing walls of the churchyard, as well as the headstones and chest-tombs. Because lowland Britain contains so few natural outcrops of rock, the churchyard is an exceptionally important habitat for those plants which grow only on stone. Many lichen species have a strong preference for a particular aspect (north, south, east or west), for sunny or shady conditions, or for different building materials -e.g. sandstone, limestone, tiles, bricks, mortar, marble or flint. Old limestone headstones are the most important sites for lichens and the biggest threats to their survival are removal of headstones or their rotation on resisting so they face in a

different direction. Any use of herbicides in the churchyard is likely also to damage or destroy lichens, which are notoriously sensitive to atmospheric pollutants. Moreover, unless disturbed by moving or cleaning, a dated headstone can give a very reasonable idea of the date of a lichen colony, which tends to form fairly quickly when the conditions are favourable, and can be very long-lasting.

Also important in this context are *stonework ferns and flowers*. Three ferns, black spleenwort, wall-rue and maidenhair spleenwort, and one flowering stonewort plant, pellitory-of-the-wall, have become rare in some parts of the country but are thriving in undisturbed churchyards (Burman & Stapleton 1988).

4.15.2.3 *Wildflowers*- The best-known flowers of meadow, wayside and woodland are usually well represented in old churchyards and a first step towards a policy of recognition and conservation is identification. With the ploughing-up or spraying of old meadowland, many meadow flowers have become very dependent on churchyards for survival. English Nature figures show that about ninety-eight per cent of herb-rich meadowfield has been lost over the last thirty years. In lowland countries, some meadow flowers have as much as fifty per cent of their surviving populations in churchyards (Burman & Stapleton 1988). Conservation measures are vital to conserve churchyard-dependent species. The work of the County Wildlife Trusts is invaluable in this context, as they are willing to carry out botanical surveys and to advise on appropriate methods of management which will respect whatever has been identified.

If some of the traditional species of wild meadowland and churchyard flowers are absent, then plants can be raised from wild seed in seed-beds or boxes and then

planted out. Parishioners are often willing to raise plants for the churchyard from wild species they find in their own garden or farmland and this should be encouraged, especially as these are likely to be of the local genetic stock.

4.15.2.4 *Insects*- Numerous species of insects can be found in churchyards, including beetles, flies, caterpillars, butterflies, moths and crickets. Grassland butterflies (the 'browns', 'common' blue, small copper, etc) are among the insects which have suffered most severely in recent decades, through the use of chemicals in agricultural practice, the ploughing-up, drainage or fertilisation of ancient herb-rich grasslands, and the gradual elimination of nettles and other wild shelter and food plants. Many species are nearing total extinction. Again, it is the *interdependence* of all these creatures in the closely growing churchyard habitat which requires to be stressed.

4.15.2.5 *Bats*-Originally bats were animals of caves and woodland, but with the clearance of woodland over the centuries, they came increasingly to live in buildings. Their colonies are usually fairly small: the hostility to them is largely on account of the smell, and the staining and damage which their droppings can cause to textiles, brass and wood furnishings. However, because of the dramatic decline in their numbers and their dependence on buildings for roosting, all bats are now comprehensively protected by the Wildlife and Countryside Act 1981. Any activity that may intentionally kill or injure bats or deny them access to their roosts is illegal.English Nature must be consulted before any action is taken in a church or churchyard which may affect bats.

4.15.2.6 *Reptiles*-Reptiles find havens within churchyards, although most churchyards are not their usual habitat, unless 'abandoned to nature' as they do not

like being disturbed. Slow-worms, declining elsewhere, are able to find sanctuary in churchyards.

4.15.2.7 *Birds*- Migrants, common resident species, even birds of specialised habitats like herons, sea-birds and waders - have all been observed in churchyards. The birds which visit or live there appreciate the combination of safe places to roost and a rich variety of food. For the visitor to churchyards or the mourner, the absence of birdsong would be an intolerable deprivation and impoverishment. Among the species frequently recorded in churchyards are tawny and little owls, woodpigeons, tits, swallows, house martins, hedge-sparrows, robins, blackbirds, thrushes, the spotted flycatcher and the woodpeckers. Jackdaws, swifts and kestrels are very typical 'tower birds'. Rookeries also are not uncommon.The Barn owl, is sometimes referred to as the 'church owl'. Spires, towers and old trees supply the barn owl with suitable hollow places in which to roost and rear its young; quiet undisturbed rural churchyards may supply the necessary food and tranquillity. Bird boxes have been successfully introduced into some churchyards.

4.15.2.8 *Mammals*- Red deer, foxes and badgers all can be found in and visit churchyards, grey and red squirrels can also be found but the latter species is more common in urban churchyards, red squirrels are occasionally found living in suitable trees. Rabbits are also fairly common, but are more restricted to urban churchyards. However a large concentration in an ecologically delicate churchyard, where there are fragile species can have a detrimental effect and rabbits must be discouraged if possible.

4.15.3 General Management of churchyards

4.15.3.1 *Grasses and grass cutting*- In a majority of churchyards it is reasonable to consider grassed areas as falling within these broad categories:-

- Paths and other areas much used by the congregation and by visitors to the churchyard:-

These can be mown as frequently as one might mow a lawn, so that there is neatness and good access on the principal routes to the church and the more recent graves. But it should be remembered, nevertheless, that even the neatest parts of a churchyard should not be fertilised and manicured like a garden lawn. The mowing machine chosen should be adaptable (without rollers and with easily adjustable height of mow). If the grass is to be grown long and cut, in July, churchyards need at least two sorts of mower, namely both rotary and cylinder, for regular cutting (but probably rotary) and then an Allensay, the type of machine with the hayfield-type 'scissors' cutters for the 'outfield'. However, for the 'outfield' a scythe or swop-hook is preferable. If strimmers must be used, they should be very sparingly, because they cause damage to headstones, as well as plants. It is best to mow these areas to a length of 38-50mm, in this way the grass will still be neat, and green throughout the year.A fair variety of grasses can be encouraged, even in a mown lawn. Daises, the mouse-ear hawkweed, *Pillosella officinarum*, with its tiny lemon-coloured flowers, and the sky-blue speedwell are among the species happy in closely-mown lawn grasses and on the raised mounds of graves.

- Areas between older and infrequently visited gravestones:-

These areas are best treated as meadow habitat, where flowering grasses and

wild flowers should be allowed to develop and flourish at their best.

The preferred treatment should be to mow less frequently, not more than once a month, and more lightly (to a height of 80mm). If possible, leave the grass here uncut from the end of April to late June or mid-July, so that the majority of flowers may blossom and perhaps seed.

- Areas rarely visited and distant from the church:-

These should only be mown twice: once in early July and once in September or early October. The bigger plants will flourish here, such as foxgloves, nettles, rosebay willow herb and sorrel (which is a food plant) for the small copper butterfly; small mammals will be left relatively undisturbed. In upland or exposed areas, a single cutting, in August or September, may be quite enough.

- Important Principles:-

In all this there must be a sense of balance, together with a developing sense of responsibility towards the wildlife community. Not to cut the grass, as far as possible in May and June is important, because many of the most churchyard dependent species (meadow saxifrage, cowslip, pignut) flower then. At the end of the season (generally early October) it is good policy to cut the grass quite short (50mm or so). This will give the small delicate species a headstart the following spring, without there having to compete with tussocky long grass. Another important point is that all areas rich in flowers (or where they are to encouraged) should be raked after cutting. Unless this is done, the decaying grass cuttings will cause a build-up of nutrients which will encourage vigorous growth of grass and choke all but the most persistent meadow flowers. The

aim in planning a cutting timetable should be to prevent the build-up of coarse tussocky grasses and keep the grass even-textured. When cutting frequency is eased off, an area may become dominated by unwanted species of vigorous growth (cow parsley, hogweed, stinging nettle); these species are best deterred by cutting (with blades high enough to miss developing flowers and leaves of more desirable species) just as they are beginning to show vigorous growth (for cow parsley this will be around the third week in April, and for hogweed in July). Finally and with suitable caveats in mind, there will also be small wild areas, in impenetrable corners or by rubbish heaps, which can be left to themselves to be wholly wild.

It needs emphasising, though that a completely unmanaged situation is not in general good for a balanced community of wildlife, and that the rational discriminating approach suggested above should provide conditions variable and satisfactory enough for the comfort and survival both of human beings and of most forms of plant and animal life.

4.15.3.2 *Hedge Maintenance*- Hedges provide shelter for birds and many other animals, including hibernating butterflies and small mammals, and so should be retained as a valuable provider of habitat.

Hedge-laying skills are now comparatively rare and so (in most cases) machinery will often be needed.The British Trust for conservation Volunteers (BTCV) run training courses in hedge-laying and a handbook is available on this subject. It may be difficult to get hedge-cutting machinery into a churchyard and so it is recommended that if a mechanical cutter has to be used for the top and outside of a hedge, the inside should be cut by hand, perhaps by a working party of parishioners. A good deal of evidence

exists on the subject of working parties: these can be highly enjoyable and involve more people in a sense of responsibility for the churchyard.

Trimming once a year is sufficient. It should be done in March, if the hedge provides fruits for wintering birds, in August-September for non-fruit-bearing hedges, so that there will be a good spread of green foliage through the winter, to provide shelter for over-wintering insects (e.g. the brimstone butterfly).

Avoiding cutting in spring when birds might be nesting. Handclipping is to be preferred to machinery if the hedge has to be cut before this time. It is recommended that hedges should be trimmed to an A-shape, thick at the base, thereby preserving their value as a habitat and narrow at the top, cut at a height of 1.8-2.4 metres; at this height, hedges can support the nests of some ten bird species.

Care should be taken not to destroy honeysuckle and bryony which may be growing in the hedges. Hazel, holly, hawthorn, viburnum, bird cherry, crab apple and beech are among the native species which do well in a hedge. It is essential not only to plant them well but to provide adequate after-care: (e.g. keep weeds away from the roots, but keep roots moist when there is no rain, plant with bond or seaweed fertiliser, which promotes good strong root growth). It is desirable to preserve a metre of uncut grass, or infrequently cut grass, next to the hedge, as cover for small mammals such as voles, as well as amphibia and reptiles. If hedges require repair or replanting, it may be worth checking with the District and County Councils to see if grants are available to assist with the planting of trees and hedges.

4.15.3.3 *Tree Planting*- Trees and shrubs, like hedges, provide shelter and food for birds, insects and bats.It is recommended that trees should be left to themselves unless they are plainly becoming a nuisance or unsafe: they should be discouraged from

growing to close to the church or churchyard wall, in case structural or foundation damage is caused and gutters become choked in autumn.

Indigenous trees should be planted when opportunities occur, and pressure to plant exotic conifers or foreign flowering species should be firmly resisted. Seedling trees or suckers of ash, yew, hawthorn, wild rose and holly usually augment the planted stock of trees in a churchyard. Often these may be encouraged, but where they are in an inconvenient place 'coppicing' is an alternative. This entails cutting the trunk back to the ground every few years - it will grow again to make a bushy many-stemmed small tree, and the cut stems can be put to use.

Care should be taken over the planting. A deep hole is essential, into which a handful of bonemeal and some compost is placed; the stake goes in first, then the tree; the hole is gently backfilled with good soil, and all is stamped down firmly. The tree is tied to a stake which should reach one-third of the way up the trunk or 0.6-0.7 metres from the ground, and the a rabbit guard must be fixed. It is recommended that the traditional practice (which is also good conservation practice) of planting large trees only round the edge of the churchyard be adhered to as this provides seclusion for people and wildlife; most significant churchyard plants, including the meadow flowers and lichens, need sunny conditions; shrub species are best planted in patches in corners of the churchyard for the same reason.

In the early months and years of a tree, care must be taken to keep the surrounding area clear of weeds -which can be mulched with churchyard grass cuttings.Care should be taken to avoid damage when mowing grass nearby. Planting small trees and indicating their presence with a rabbit guard is usually successful; if larger trees are planted, use a low stake and remove it after a few years.

The commoner trees are not expensive to buy and it is worth noting that small trees

are established more easily than bigger ones, whose growth they often overtake in a few years. They need protection from rabbits, hares, sheep and dogs. If a grant can be obtained it is likely that it will also partly fund rabbit guards.

4.15.4 Churchyards in Durham

4.15.4 St Oswalds Churchyard (Grid Ref NZ 276 419)

4.15.4.2 *Background-* St Oswald's is the oldest parish churchyard in Durham City, with a continuous history of use as a churchyard which stretches back to Anglo-Saxon times as attested by stone grave markers. The church was possibly sited in relation to St Oswald's Well which lies just to the west of, and below, the area of level ground which forms the churchyard, which may have been regarded as a holy well in pre-Christian times. As well as its rich history, a second feature of St Oswalds is that the churchyard is both 'urban' and 'Rural' simultaneously -to the east the churchyard leads straight onto Church Street; to the west, it merges directly into the woodland of the river banks (**Figure 4.6**).

Green space establishment according to ecological principles entails careful selection of native species suited to site conditions and local to the area, and planting stratergies which seek to mimic the community composition and structure of natural climax or seral stages. This is in esssence what has been done at St Oswald's, with the emphasis on planting native wildflower species and introducing less intensive management regimes.

The churchyard lies close to the city centre and is very accessible to people;

but at the same time is linked to the outlying countryside by the wooded river banks, which serve as a 'wildlife corridor'. The wildlife corridors link up the cemeteries in the city with the open countryside at Mountjoy, to the south of the Stockton Road

cemetery and passing through the late nineteenth century extension of the churchyard

Fig. 4.6 St Oswalds Churchyard (Grid Ref 276419) looking towards the wooded Riverbanks

opposite St Oswalds, now used as a children's playground and park (**Figure 4.7**) (Claire Stancliffe).

4.15.5 Stockton Road Churchyard (Grid Ref NZ 277417)

4.15.5.1 *Background-* This cemetery is no longer in use as a place of burial (apart from odd exceptions), but some graves are still tended by relatives. The cemetery lies at the boundary of the town and the countryside; and it forms part of a 'green corridor'chain which links the countryside with the river banks.

It has a good variety of birds (sightings include greater spotted woodpecker and goldcrests, while song thrushes, on the decline nationally, probably nest there); these and the flowers and trees, give much pleasure to the neighbouring residents, and to those who walk through it.

As part of St Oswald's its maintenance has also been handed over to Durham City Council. Maintenance includes strimming the grass three times a year (in May, July and September), other work is carried out on an ad hoc basis, either by the Council or parishioners. Up to around the 1960s the churchyard was scythed annually in the 1970s, the council switched to regular mowing, the emphasis being on tidiness. In the 1980s hand held machines were replaced by large ride on machines. Because of the uneven ground this meant an uneven cut: some areas were scraped free of grass even more serious the gravestones suffered damage from being bumped by the large lawnmowers.

Against this background Claire Stancliffe wrote a report for the Parochial Church Council (P.C.C) outlining the churchyard's importance and suggesting that the then

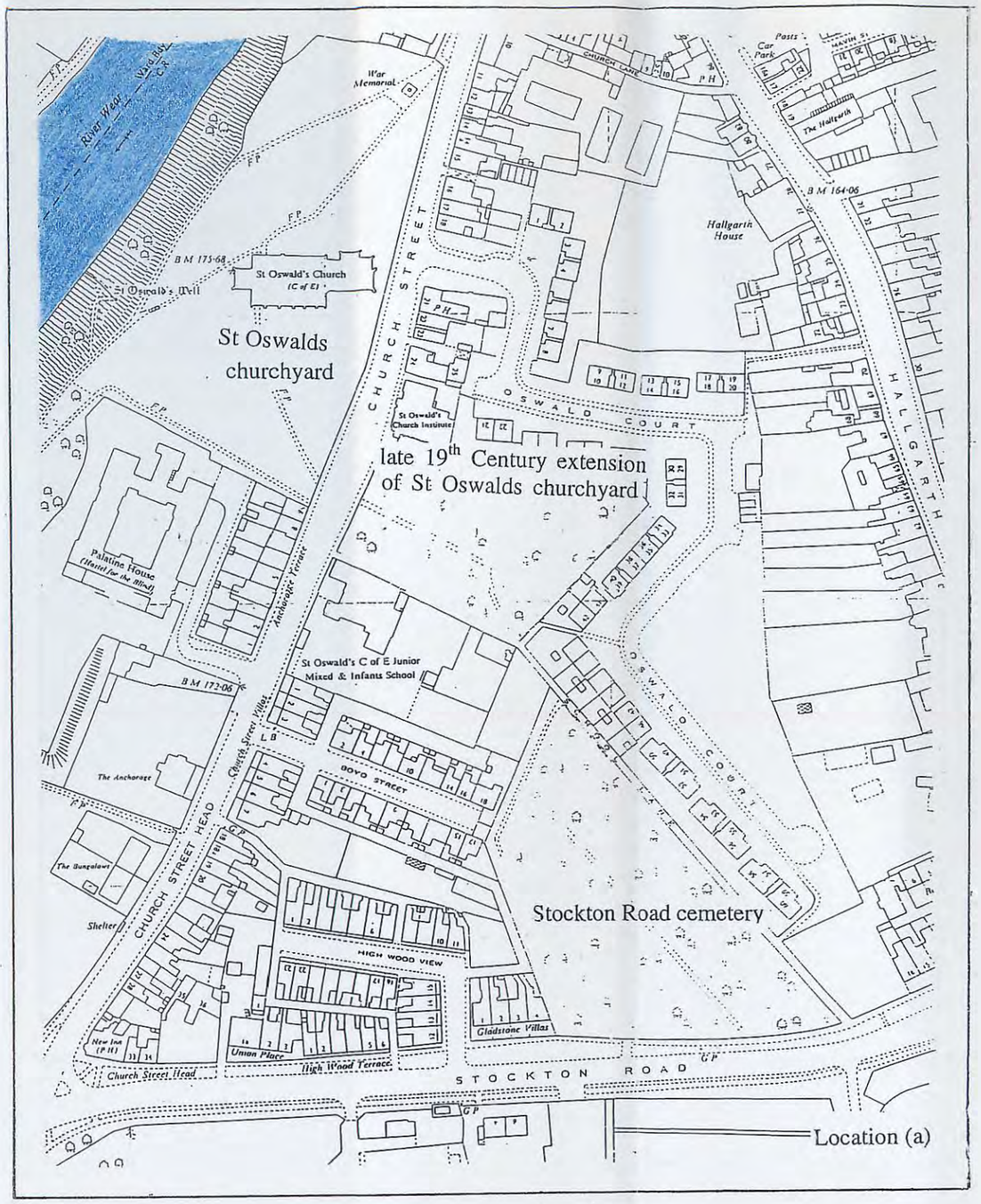
Fig. 4.7 The late 19th Century extension of St Oswalds churchyard now used as a children's play area, by St Oswalds infant school

current management practice of close mowing the entire churchyard once every two weeks should be changed. Instead in the report less mowing was advocated, if mowing was carried out then it should be done with hand held machines, this had a three fold benefit, firstly the hand held machines could be used more precisely by the operators and as a result the gravestones were preserved intact. Secondly the hand held mowers suited the more sympathetic management approach. Thirdly the new regime was financially better for St Oswald's. After meeting with the Council this new maintenance was agreed. The management now benefits both people and wildlife and is entered in competitions, ('Britain in bloom') as an example of co-operation between the Council and the local community for events.

4.15.5.2 *Current Management*- Between late April and early October, both parts of the churchyard are mown once a month by the Council who use hand-held rotary mowers, with the blades set high. At St Oswalds are 3 set-aside areas marked A, B and C on the map (**Figure 4.8**) and are excluded from this treatment. Area A is left till early July, then cut by a St Oswald's parishioner with a scythe and a strimmer (the grass cuttings are used to feed a parishioners horse). For the remainder of the mowing season, the Council's ground maintenance staff take it into their regular cutting regime. Area B is left till the end of July or later, and then cut and treated as area A The regime is adjusted to suit the mouse-eared hawkbit and fox and cubs, which both grow here. Since regular mowing ceased, wild bluebells have appeared and begun to establish themselves in the shade.The area marked C was at one time a rockery of the nearby house.When the present rector and his wife arrived it was full of rocks and couchgrass. It was cleared by them and was reseeded with fine grass, and also some

native wild flower seeds.The only management it receives now, is a cut once a year in September.The whole churchyard is strimmed once a year by the Council in September.Other work is done by volunteers from St Oswald's, as and when need arises.

4.15.5.3 *Future Management*- The future management of St Oswalds and Stockton Road cemetery will continue to be carried out by the City Council, Ben de La Mare (Rector of St Oswalds) and Claire Stancliffe in a similar way as at present. A good level of management exists, along with a balance that takes into account harmony with the countryside, a sympathy with the environment and a respect for the wild vegetation.



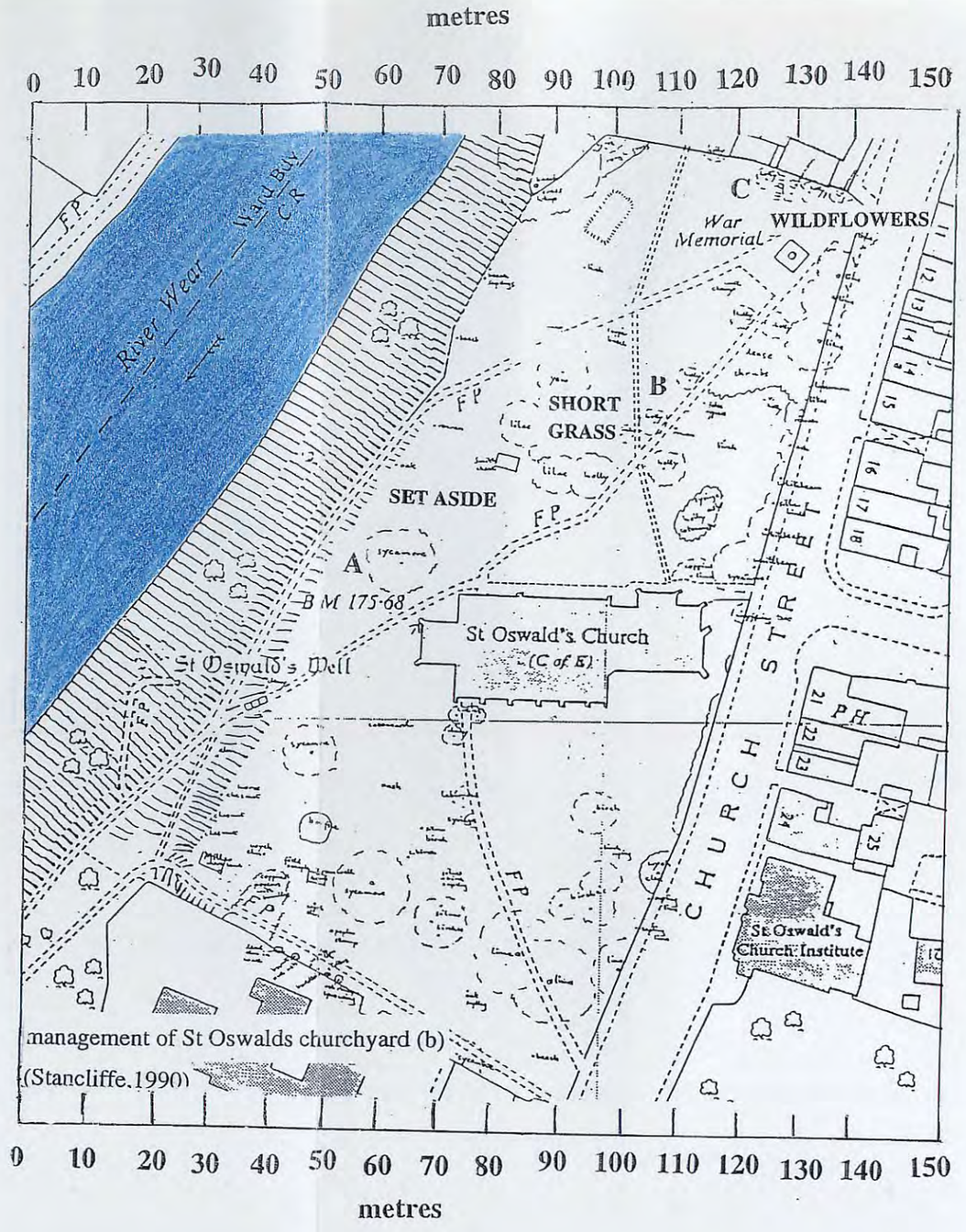


Figure 4.8 Location and management of St Oswalds churchyard

Key

A = Spring meadow mown in July - long grass, mouse-eared hawkbit

B = Wildflowers -Wild Bluebells, primrose, fox and cubs, Lady's Bedstraw

C = Rockery now planted with native wildflowers

The basic guidance given by The Churchyards Handbook on mowing regimes are:-

- Paths and much visited areas should be frequently mown (every two weeks);
- Less visited areas should be mown not more than once a month and more lightly (to a height of 80mm); and if possible the grass here should be left uncut from the end of April to early or mid July, to allow flowers to blossom;
- Areas rarely visited should be mown only twice: once in early July and once at the end of September to leave tidy for the winter.

4.15.5.4 *Management options for cemetery green space*-Nearly as many management options exist as there are cemeteries. A common objective should be the preservation of any original structure planting, both as an example of Victorian fashion and for its value to nesting birds. The historical importance of relic and naturalised planting should also be recognised and no attempt made to eliminate exotics if they are established, as they are part of the landscape and help to make cemetery vegetation distinctive. Occasionally excessive dominance by Japanese knotweed, bramble,Himalayan Balsam and horsetail may need to be checked. In general low levels of maintenance carried out regularly produces the richest wildlife and best

usage.The following are examples of different churchyards located around the country which demonstrate different landuses according to their management:-

4.15.6 The Nature Reserve :- Rawmarsh High Street cemetery, South Yorkshire

This 2 ha local authority cemetery (1856) is rarely visited by the public as it is a 'closed' churchyard, the Church Council, increasingly reluctant to maintain it to traditional standards, turned it over to theYorkshire Naturalist Trust. As a result the cemetery receives one cut every two years in late summer this is done with strimmers, the cut grass being raked off and removed by tractor, the operation which takes six men a month, has reduced maintenance costs by 80%. The cemetery is usually a mass of daffodils in the spring and cow parsley in June, while in late summer large beds of bramble, nettles and ivy which are left unmown form a feature. Mature ash, horse chestnut and laburnum are also well represented. A small amount of old pastureland is present which contains *Succisa pratensis, Sanguisorba officinalis* and *Potentilla erecta.*

4.15.7 Non-intervention :- Nunhead, London

In 1975 the borough of Southwark bought this long-neglected cemetery there were plans to divide 10 ha into working cemetery, 10 ha managed as a nature reserve and 4 ha converted into a park.This plan has only been partly executed with the consequence that most of the site has seen little maintenance for nearly 50 years a dense secondary woodland of sycamore, Norway maple, oak, ash and elm covers the site, its composition depending on the distribution of seed parents.Where this woodland has been cleared the glades fill up quickly with bramble or knotweed.

The plant diversity, the varied structure of the vegetation and the size of the cemetery suggest the site will support a rich fauna; foxes, owls and bats have been reported as breeding. Nunhead probably contains the largest area of the most advanced successional vegetation stage of any cemetery in Britain.

4.15.8 Overgrown cemeteries :- Abney Park, London

This 13ha private cemetery was laid out in 1840 as an arboretum though many of the trees were later removed to make way for additional graves.Between 1939 and 1979 the area received little Maintainance and sycamore, ash and Japanese knotweed took over as the cemetery moved towards becoming a dense species-poor woodland. A management plan with the objectives of providing for passive recreation, education, burials, nature and memorial conservation through a system of zoning was recently implemented. Though 28% of the mature trees are sycamore, a tolerant view is taken of its presence because of the food chain it supports; consequently it is only cleared where glades are required, by contrast ways are being sought of totally eliminating Japanese knotweed from the site.

4.15.9 Ornamental horticulture :- Moorgate, Rotherham, South Yorkshire

This cemetery (used from,1846) had a Victorian planting structure, which was 50% sycamore, 20% holly. Since 1978 over 180 trees and shrubs of high horticultural value have been introduced. The trees are shown off against a background of highly maintained landscape. For the last 7 years a herbicide has been used among the graves; this has resulted in stonecrops, *Crassulaceae* on grave Chipping's and where used on soil, deep rhizomatous vetches, peas and convolvulus have increased together with willowherb, all of which benefit from the absence of competition from more susceptible species.This approach, using the methods of ornamental horticulture, has the merit of encouraging visitors thereby reducing vandalism.The general structure and diversity has incidental wildlife benefits.

4.16 Allotment gardens in cities (Grid Ref NZ 269421 - Margery Lane allotments)

4.16.1 Background

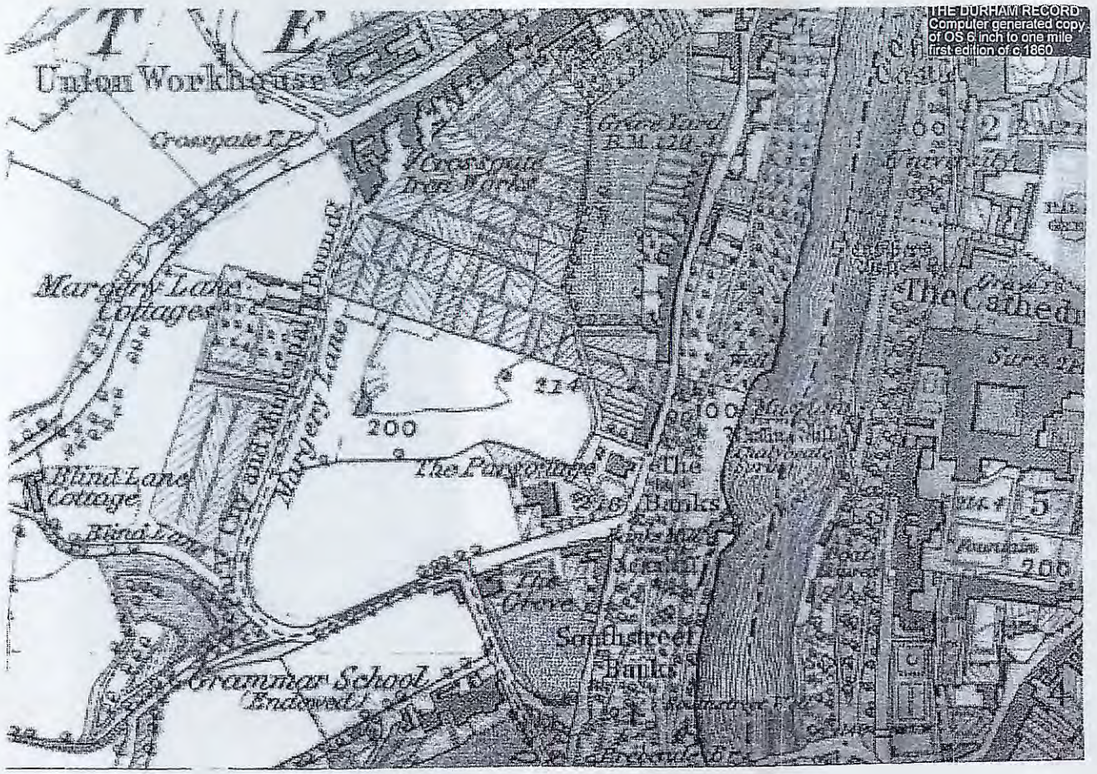
Allotment development perceived as clusters of semiprivate rectilinear plots, monotonous in layout and often unattractive in appearance, is a feature of most towns and cities in Britain.The average provision in urban areas is around 0.4 ha per thousand head of population (Gilbert 1989). Its importance as a habitat for plants and animals lies in the rich and varied native species as well as 'aliens' which are constantly present in the worked plots, the strange secondary successions which commence once holdings become abandoned and the frequent occurrence of stable supplementary habitats all make this an important city green space.

Early allotments from about 1750 were known as 'guinea gardens' as the annual rent

was often one sovereign.These small gardens were for the recreational enjoyment of the middle classes, who cultivated them for flowers and produce. After 1830 the land was mostly sold for development, but they persisted longer in certain cities, such as Newcastle upon Tyne.

Their successor, the urban allotment was the result of a completely different social concept. These were originally provided by charity so poorly paid labourers could supplement their income. The allotments at Margery Lane in Durham were created for this purpose (**Fig 4.9**).

After the allotments act of 1887 and 1890, local authorities were obliged to provide them by law, but many sites were only temporary, national interest boomed during World War I, fell off in the depression, then reached an all-time peak in 1940 when 1.5 million plots covering 57000 ha were being worked. A rapid decline in interest followed peace, so by 1949 about a third of all plots were uncultivated, despite much land being relinquished, the decline lasted until the early 1970s when whole sites had returned to nature. In future years a lot of the land has been sold for housing, converted into public open space or thickened with extra planting and left to grow into woodland.Today the greater majority of sites that are left, remain traditional in layout 0.8-4.0 ha in size and situated in the middle to outer zones of cities.Their location is the result of chance rather than planning. Space use in the average plot is 70% vegetables, 10% flowers and 4% fruit, the remainder being uncultivated, paths, huts, etc. Owner motivation tends to be relaxation, recreation and leisure rather than productivity (Gilbert 1989).



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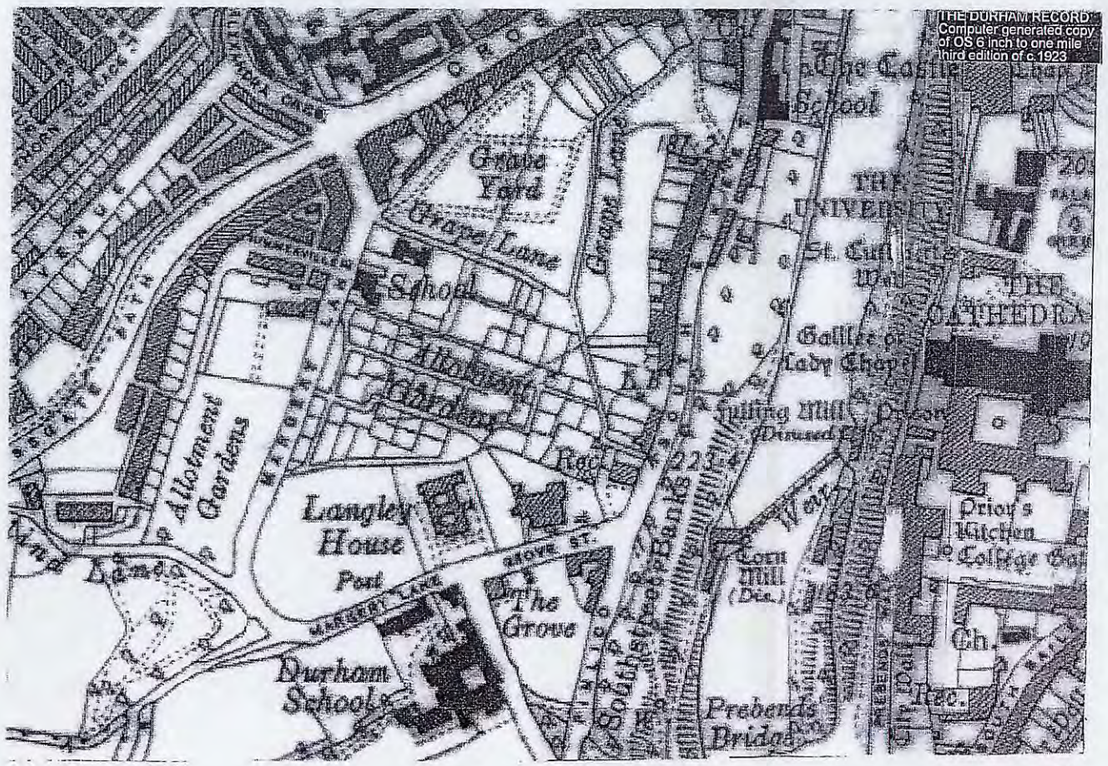

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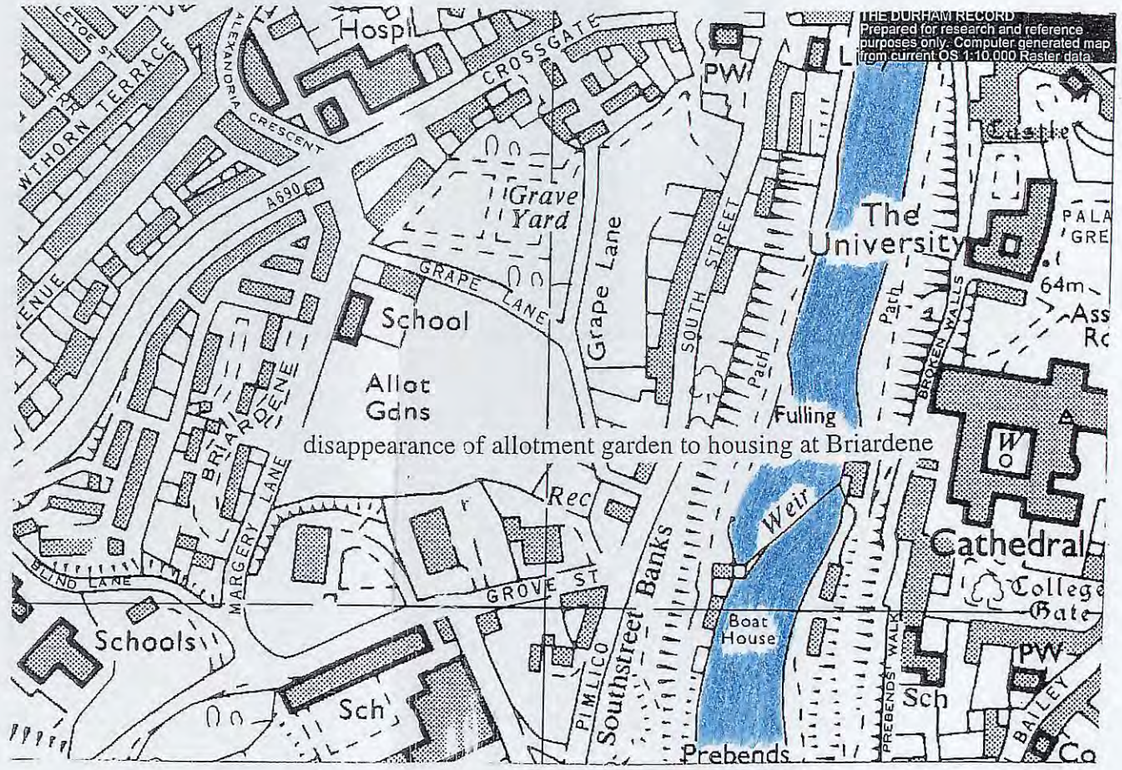


disappearance of allotment garden to housing at Briardene

(c)

Fig. 4.9 Ordnance Survey map section of 1850 (a) 1923 (b) and present day (c) showing location and enlargement of the Margery Lane allotment gardens site over the years (Durham Record 1997)

4.16.2 Current Management

4.16.2.1 *Cultivated plots* - On most allotments the soil is dug over at least once a year, a factor which precludes most biennial and perennial plants, but provides suitable conditions for over 50 species of annual. Annuals will germinate and flower at any time of the year, provided that the temperature is high and the soil sufficiently moist. A few perennials with underground stems thrive in allotments where they are regarded as weeds they include the common horsetail (*Equisetum arvense*), bindweed (*Convolvulous arvensis*) and couch-grass (*Aegopodium podagraria*).These rhizomatous weeds are commonest on clay soils which are very difficult to clear. Horsetail is resistant to all commonly available herbicides and grows so vigorously that where it gets hold, plots have to be abandoned.

In a nation wide survey of allotments (Gilbert 1989) there was no strong regional patterns of weed species discernible, variation within towns tending to be as great as between them. Soil type exerted the greatest influence with annual mercury (*Mercurialis annua*), small nettle (*Urtica urens*) and black nightshade reaching unusual levels of abundance on deep fertile well-drained soils, while *Anagallis arvensis,* corn spurrey, (*Spergula arvensis*) and field pansy (*Viola arvensis*) pick out less-fertile more-mineral substrates.The occurrence of bird-seed aliens on allotments where pigeon lofts are permitted again adds to the flora already present.

Margery Lane Allotments (NZ 269421) contained a variety of species, including common chickweed (*Stellaria media*), herb groundsel (*Senecio vulgaris*) and annual meadow grass (*Poa annua*).

4.16.2.2 *Secondary Succession*- The decline of interest in allotments has resulted in many sites containing abandoned plots, so a mosaic of successional stages is present. Generally, after 2-3 years without cultivation a variable Yorkshire-fog (*Holcus lanatus*)-creeping bent (*Agrostis stolonifera*) grassland usually establishes containing scattered patches of taller species such as docks, thistles, nettles and hogweed (*Heracleum sphondylium*).Woody plants may establish, broom, gorse, willow and sycamore.By 4-6 years, tall herbs have become dominant with *Holcus lanatus* and *Poa trivialis* confined to the understory and *Agrostis Rumex* declining. Many plants of garden origin are now prominent such as Michelmas daisy (*Aster novi-belgii*), shastra daisy (*Leucanthemum maximum*), goats rue (*Galega officinalis*), horse raddish (*Armoracia rusticana*), mints (*Mentha spp.*), fennel (*Foeniculum vulgare*), lupin (*Lupinus polyphyllus*), tansy (*Tanacetum vulgare*) and cultivated brambles like *Rubus* 'Bedfordshire giant' large grasses such as cocksfoot increase as do the woody species. After 10 years areas have the appearance of open scrub with brambles, raspberries and even bracken on the more acid sites, but still contain persistent garden relics; in wet areas rushes (*Juncus effusus, J.inflexus*), and great hairy willow-herb are common. Sites that have lain derelict for over 10 years have a large dense woody ground cover and from that point the progression to woodland depends largely on the growth of young trees already present and especially on the presence of hedges.Hedges and bramble patches remain 'open' which allows tree establishment to continue for longer than in grassland. The young woodland is variable in composition, but ash, sycamore, elder and goatwillow are usually present, together with hawthorn and oak, both of which have some ability to establish in dense vegetation (**Figure 4.10**).

Fig. 4.10 Margery Lane allotments (Grid Ref NZ282448), Durham City shows particular abandonment to nature, with many forest sized trees and shrubs

At Margery Lane allotments it can be seen from the photograph that the site is in an advanced state of secondary succession and it is only due to some of the green houses remaining, that it has not taken on the appearance of an area of natural scrubland. The constant presence of woody exotics not normally present in British woodland separate these young allotment woods from all others, e.g. privet (*Ligustrum ovalifolium*) and lilac (*Syringa vulgaris*), although it is not yet possible to say how persistent these garden relics will be.

4.16.2.3 *Future Management/ Recommendations*- If allotments are abandoned, they can be returned to a cultivated state or allowed to turn into wildlife refuges.

The Leisure Garden Movement established in Birmingham in 1973, which seeks to devote up to 20% of each site to general amenity offers the greatest opportunity for enhancing the natural history interest of allotments. Incorporating existing site assets such as streams, hedges and rough grassland into new or redesigned layouts, as has been achieved at many sites in Birmingham, the result provides a highly satisfactory pattern of cultivated plots, tended open space and informal wildlife areas. Locally, simple habitat creation within the wildlife/tended open space zone can, by allowing long grassland to develop, planting shrubs as cover for birds or introducing 'insect' trees such as alder, birch, oak and willow, further enhance its value. Designating long derelict allotment sites as local nature reserves is a further way of changing the use of Council-owned land to fit the aspirations of the modern city dweller.

4.16.2.4 *Wildlife on Allotments*- Certain forms of wildlife are incompatible with well-tended allotments.These include woodpigeons, grey squirrels, wild rabbits, slugs, snails, insects such as greenfly, blackfly and cabbage white butterflies, most perennial plants and tree belts which cast a heavy shade. Despite action to discourage these, a lot of incidental wildlife is present. Annual weeds that accumulate seed banks are perfectly adapted to the conditions, mobile species such as birds will always be prominent, foxes will continue to breed under the huts and invertebrates to form rich communities in the numerous compost heaps. Allotments in cultivation, especially if there is a small amount of cover in the form of hedges and bushes support quite high densities of territorial insectivorous birds such as song thrush, blackbird, robin, wren and dunnock. All these species feed on the allotments and nest in nearby cover.When whole sites are abandoned hedges become overgrown and scrub increases so that other birds are favoured. Garden warbler, reed warbler, collared dove, jay, blue, great, long-

tailed and occasionally marsh-tit plus goldcrest often make use of scrub-infested allotments.

4.16.2.5 *The future of allotments in cities*- Allotment land in cities, has been continuously under threat in recent years from land owners such as Railtrack and the Church of England selling allotment land to developers. More than 10,000 plots have been sold to developers since 1978. As a result tenants of allotments are resorting to direct action by sabotaging machinery and burning eviction notices (**see Appendix 4 and 5**).

4.17 Railway land in Durham (Grid Ref NZ 282448- Low Newton Junction)

4.17.1 Background

Railway land occupies large areas in the hearts of cities. In addition to mainlines and stations, extensive areas of cuttings, embankments, flats and sidings make up a cities green network. It has been calculated that there are about 4000km of active track in urban areas to which must be added an unknown length of disused track.Owing to access difficulties, railway property is a poorly known habitat though a walking permit can sometimes be obtained for non-electrified stretches of line.

The railway provides a number of sharply contrasting habitats: the permanent way, sidings, cuttings, embankments and in addition masonry and brickwork. In urban areas sidings, walls, buildings, bridges and cuttings are particularly well represented.After churches and canals they are among the oldest structures to be found in towns and cities, the majority having originated between 1840 and 1870.Until about 1960 maintenance was carried out by small 'length' gangs of five or six men responsible for around 8 km of line; they cut back trees, bushes and brambles, hoed the ballast clean and fired the whole property. In the early sixties reorganisation resulted in less

attention being paid to vegetation management and this trend has continued.Today little is carried out beyond that which is essential for safety. Currently, most management operations are performed by rail-mounted machinery such as flail mowers fitted to booms or specially designed trains. Railtrack retains the right to use fire but rarely resorts to this traditional management, and almost never in urban areas. Changes to this minimal maintenance programme are unlikely owing to lack of finance and a dwindling knowledge of vegetation among railway staff.

4.17.2 The Permanent Way

The permanent way is the name given to the ballasted road bed on which the track is laid the key to the construction of the permanent way is free drainage; this also determines it's management. Every 10 years or so the ballast is mechanically sprayed to prevent a build up of humus, the resulting fines being tipped on the verge by conveyor belt where they influence plant growth.One of the main reasons for spraying the permanent way is to prevent invasive weeds contributing to the build up of dirt, so successful are the spray mixtures applied in early summer each year that along mainlines very little grows on the permanent way or access path, at least fourteen herbicides are approved for use on railtrack land. Despite this, a few groups of plants which show tolerance or possess avoidance mechanisms can be found on or adjacent to the permanent way, though it is rare to see anything on the track ballast.Growing at the margin of sprayed areas rhizomatous species such as bindweed, common horsetail colts foot and rosebay willowherb form dense areas as a result of their slightly greater resistance to the herbicide regime. Scramblers such as bramble and ivy, may also invade close to the track during the growing season.

Before the advent of herbicides on the railways (about 1932, but not general until

rather later) the permanent way provided a singular very sharply drained habitat for plants. Dony (1955) and Salisbury (1961) describe the ballast community as being characterised by spring and early summer flowering annuals of dry soil.

4.17.3 Sidings

The main characteristics of this habitat relates to the substratum, which is a deep very freely draining coarse mineral soil, low in humus with a pH, when freshly disturbed of 6.0-7.4 but capable of being leached over several decades to below pH 5. Most sidings are effected by low levels of disturbance associated with their access routes to adjacent mainlines.Operational sidings, now in the minority, are sprayed by Railtrack personnel using Knapsack equipment but not quite to the standard achieved by herbicide trains, so plants find an erratic home here.Whether active or abandoned, urban sidings provide an important refuge as well as well as supporting successions and ecotone development up to 30 years old in this stressed habitat, summer drought, nutrient deficiency and moderate disturbance combine to favour small annuals and short lived perennials. Biennials are also particularly characteristic of sidings where the open conditions and intermittent disturbance favour their life style commonly found species include carline thistle (*Carlina vulgaris*), centaury (*Centaurium erythraea*), foxglove (*Digitalis purpurea*), teasel (*Dipsacus fullonum*) and evening primrose (*Oenothera spp*).

As well as native species of plants along the routes of railways, non native species can also be found, several studies have been done on the latter.Lehmann (1895) distinguished between railway plants in the broad sense, which covers the flora of a railway system and in the narrow sense which is concerned only with plants imported over long distances. In the days when large amounts of freight were regularly handled

by the railways, temporary populations of exotic species could be found along the line and at most sidings.

For a few years after they are abandoned or if spraying is discontinued, sidings can very quickly become colonised by opportunists annuals, in particular, sticky groundsel (*Senecio viscosus*), Oxford ragwort (*S.squalidus*) and American willowherb (*Epiilobium ciliatum*) any one of which may be dominant. If allowed to occur this is the start of a rather slow succession towards dry eventually fairly acid woodland.

4.17.4 Verges

The verges which comprise cuttings, embankments and flats are the most conspicuous part of a railway.On flats and the sides of low cuttings large patches of competitive species (Grime 1979) develop often in response to the dumping of fertile material such as domestic waste or builders rubble on to the verge.This contamination, disturbance and nutrient enrichment promotes dense stands of *Convolvulus arvensis, Epilobium augustifolium* and *Lolium perenne.*

As discussed before a high proportion of non native plant species is a characteristic of urban railway verges. Many of these species are widespread around towns which in addition to several of the species mentioned above include the buddleia, comfrey (*Symphytum x uplandicum*), Michaelmas daisy, lupin, tansy, honesty and horseradish (*Armoracia rusticana*). A further group includes showy plants of garden origin which are not particularly common in towns or cities as their chief method of spread in this country is by vegetative reproduction.These enter the railway vegetation through householders dumping garden refuse and are particularly common by bridges and where gardens and allotments back on to the line. Commonly observed species originating in this way are iris, daffodil, montbretia, shastri daisy (*Leucanthemum*

maximum) creeping campanula, (*Campanula rapunculoides*), perennial sunflower (*Helianthus rigidus*), broad-leaved everlasting pea, (*Lathyrus latifolius*), geraniums including *Geranium endressi* and spotted dead-nettle.

4.17.5 Boundary features

Railway posts are colonised by an ecosystem of small crustose lichens.The other characteristic feature of railways both in use and disused, is the hybrid black poplar. It is so common by mainlines into cities, in sidings and planted as a screen at the foot of embankments that it has been named the railway poplar.

4.17.6 Low Newton Junction nature reserve (Grid Ref NZ 282448)

Low Newton Junction is a varied site that has developed between two dismantled railways and the embankment of the operational East Coast Mainline. It is 4.25km outside of Durham City and is owned and maintained by the County Council. It consists of a variety of habitats and has developing flora and fauna. Because of this it is described as having a considerable potential as a local conservation site.Railway sites are of considerable value for wildlife as they are usually undisturbed and have the potential for a wide diversity of habitats (**see Appendix 6**).

The area is also used by the local population as an area for recreation and walking dogs. Despite this wide use it still produces a variety of plant life and in spring has an abundance of the orchid *Dactylorhiza purpurella.*

The animal life is also varied. The birds are typical of scrub and developing woodland but with additions due to the wetland habitat e.g. mallard *Anas platyrhynchos*. Very few quadrupeds have been recorded, the exceptions being common frog (*Rana temporia*) and smooth newt (*Triturus vulgaris*) but it would be suprising if the commoner, smaller mammals such as bank vole (*Clethrionomys*

glareolus), wood mouse (*Apodemus sylvaticus*), and common shrew (*Sorex araneus*) were not present.The permanent and semi-permanent pools (**Figure 4.11**) on the site

Fig. 4.11 Low Newton Junction (Grid Ref NZ 282448) permanent and semi-permanent ponds, where the common frog and smooth newt can be found

provide habitat for the three-spined stickleback (*Gasterosteus aculeatus*) and in the spring, the tadpoles of the common frog can be seen.

The nature reserve can be reached by a tarmac cycle path, (which can also accommodate cars) which begins in Durham City at Sidegate and follows the river out of the City to Newton Hall. The path is 2.4 km in distance and is popular with local residents and is used as a short cut into the City. For the site description, additional information and additional species list for Newton Hall Junction (**see Appendix 7**).

4.17.7 Recommendations for Railways

4.17.7.1 *Railway walks- General Resurfacing specification*

The Nature Reserve at Low Newton Junction is well used and the path could be resurfaced in places as erosion in some parts is evident, this has been accentuated with motorbike use.Below is a resurfacing specification for Low Newton Junction :-

Considerable work has been carried out over the past 5 years to re-surface railway walks with durable, cheap and aesthetically satisfactory combination of materials.

To ensure user separation, the surfacing is lain to a width of between 2.5 and 3.0 metres.The construction is then usually 150mm of whinstone Type 1 MOT sub-base which is well compacted with a twin drum vibrating roller, this is then top dressed with 15mm of 3mm-dust whinstone, again well-compacted. After a short period and a little rain the surface goes very hard, is resistant to frost action and all types of 'normal' use. A very useful alternative material to the sub-base is cold plannings, this is waste tarmac from road re-surfacing schemes. Many thousands of tonnes have been used over the years and it is considered environmentally friendly as its use precludes quarrying new stone and utilises a waste product. It also binds together extremely well and is more resistant to water erosion.Where ground conditions are poor, Terram or a similar geotextile can be used with a 150mm layer of clean, free-draining material under the sub-base. This construction is very hard wearing and will last. It is essential that the drainage is done at the same time whether by the formation of new ditches (cheaper to provide and easier to maintain than pipes) or restoration of existing lineside piped systems.

4.17.7.2 *Access*-To try and ensure only authorised users gain access, controls are

constructed which aim to prevent vehicles and motorcyclists. It is impossible to prevent the determined scramble bike but a no motorcycle sign and a horse stile deter most potential intruders. Vehicles can be a problem and maintenance gates that use to be timber field gates have now been replaced with extremely effective steel boom-gates. Pedestrians are admitted via a 400mm squeeze which cyclists can also get through.The layout of each access is determined by local conditions but normally the horse stile is at least 12m back from the carriageway with either a barrier to prevent direct access onto the road or else is orientated at an angle to the carriageway.The squeeze is fitted in wherever appropriate and is simply a gap in the fence or between the fence and horse stile or boomgate.

4.17.7.3 *Railway walk maintenance costs*-This typical cost breakdown assumes that development works have replaced all boundary fencing, provided an appropriate surface, installed an effective drainage system and erected durable access controls. Also it is assumed that any bridges and culverts on the route have been brought up to the best possible condition and no further works should be necessary for 40 years.

Costs per 1500m per annum therefore include:-

- Ranger presence one half hour each week including vehicle and equipment = £300.00, (1997).

  Repair/replacement of fencing (post, stocknetting and two strands of barb on both sides) assuming 30 year life expectancy i.e. replacing approximately 100m per annum (although little replacement will be undertaken before 12 years has elapsed from initial erection) at an estimated cost of £6.00/m = £600.00, (1997).

- Surfacing reinstatement will be required every 10 years.Assuming a 2.5

width, the partial reconstruction of 1500 linear metres using planings and whinstone dust and a relatively short lead from material stores, equates to an annual cost for 150m of resurfacing = £450.00, (1997).

Other incidental costs of gate repair/replacement, removal of tipped material, general maintenance and some information sign replacement = £200.00, (1997).

Total = £1650.00

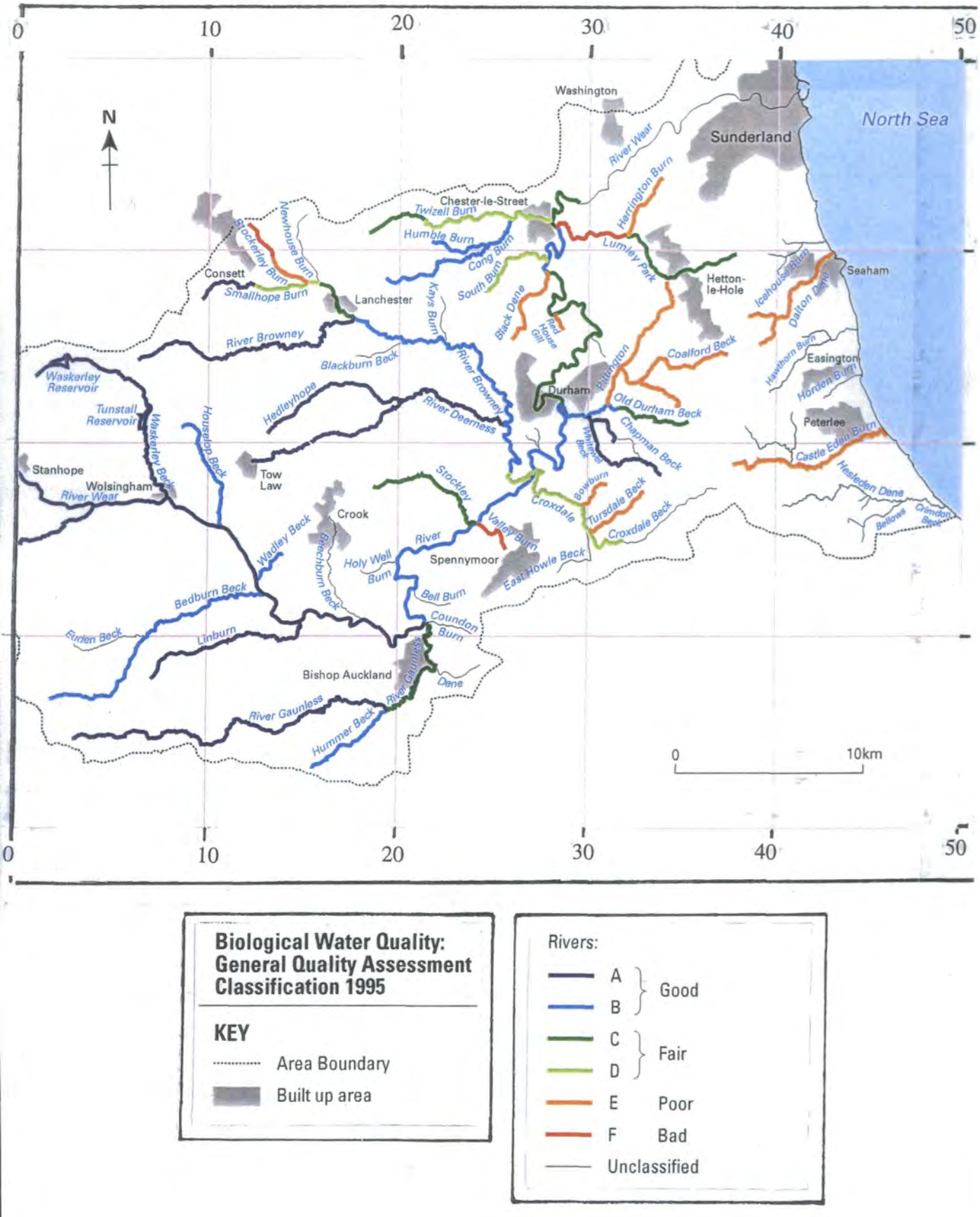
4.18 **The Durham Peninsular and Riverbanks** (Grid Ref NZ 271421) - (Southstreet Banks)

4.18.1 Background

The River Wear rises at about 650m O.D. on the Pennines. It flows eastwards, towards Bishop Auckland where it turns northwards towards Durham the river begins to meander, past Durham and Chester-le-Street, from here it flows north east through Sunderland and Wearmouth into the North Sea (**Figure 4.12**). The catchment is crossed by three major north south transport links, the A19(M), the A19(T) and the east coast railway line (County Durham, SoE Report 1993).

The River Wear gorge around Durham was the reason for the founding of the settlement, as it was defensible from all points of the compass and provided a good vantage point for the surrounding land. Later the river became useful in the establishment of industry at the time of the Industrial Revolution, for use in factory processes and cooling machinery.

Today the riverbanks around Durham are an essential part of the character of the city and they are arguably the most important green space in Durham, cover more than 50 hectares and provide the setting for the Cathedral and Castle on the peninsular (**Figure 4.13**).



Biological Water Quality: General Quality Assessment Classification 1995

KEY

Area Boundary

Built up area

Rivers:

A, B — Good

C, D — Fair

E — Poor

F — Bad

Unclassified

Fig. 4.12 Location map of River Wear and other rivers in County Durham and Biological Water Quality Assessment Classification (Environmental Agency 1995)

Fig. 4.13 The wooded riverbanks create an impressive setting for the Cathedral on the Peninsula (with the Fulling Mill, Archaeological Museum in the foreground)

The extensive woodlands soften and frame many picturesque viewpoints in various locations along the riverbanks and are visited by thousands of people throughout the year (**Figure 4.14**).The riverbanks provide an instant escape from the city and are used by people for walks, picnics, fishing and general leisure pursuits.

The river has a long tradition of University rowing and rowing boats are also for hire to tourists. A passenger boat 'The Prince Bishop' which caters for cruises around the

peninsular is also available (**Figure 4.15**).

Fig. 4.14 The woodland path from Silver Street (Grid Ref NZ 273423) in the city, is popular with tourists making their way up to the Cathedral

Although now primarily used for recreation, the river and its banks have been, through history used for a defensive barrier, a castle moat, allotments, an industrial power source and an open sewer.

In 995 AD the monks of the community of St Cuthbert settled on the peninsular at Durham, on the site of what is now the Cathedral, they had come from Lindisfarne

bearing the body of their saint to safety from Danish raiders, at Durham they found an established agricultural settlement. On the peninsular they erected a temporary wooden church and then a stone minster. After the Norman conquest they were ejected and replaced by Benedictine monks (M . Johnson 1992).

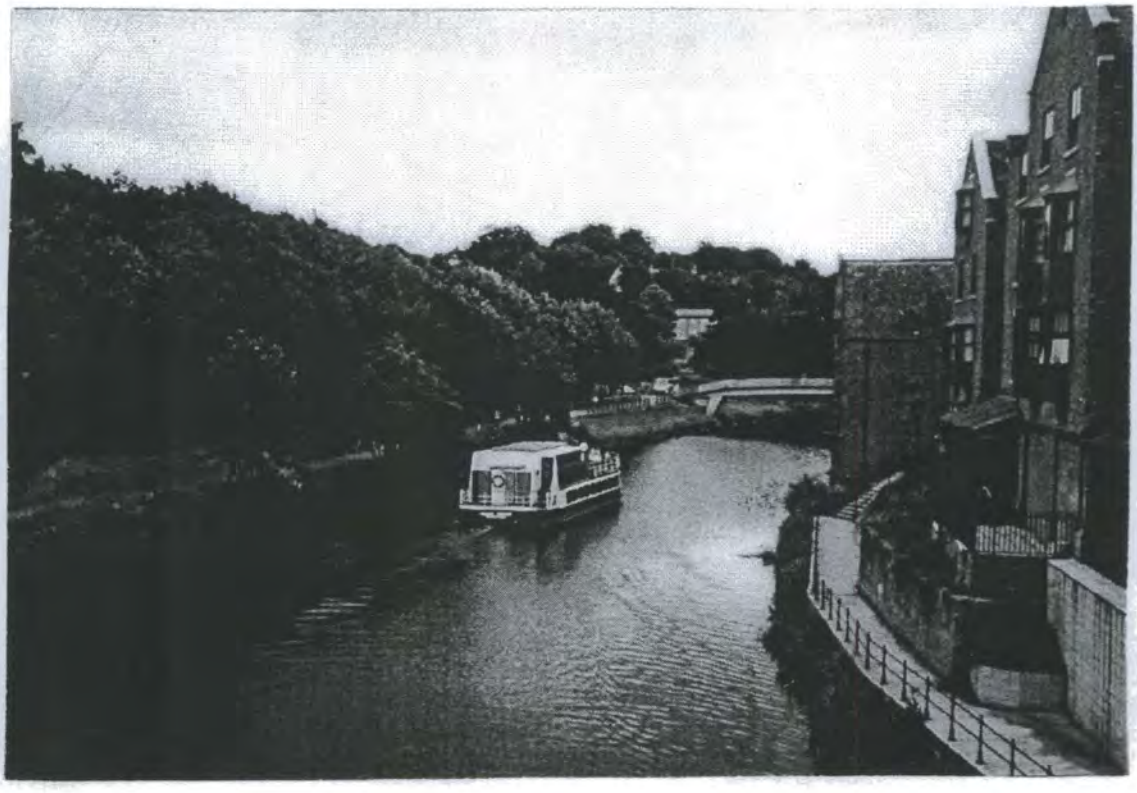


Fig. 4.15 MV Prince Bishop near Baths Bridge (1991) (Durham Record, 1997)

Evidence suggests that the top of Maiden Castle was levelled while William I was concerned with fortifying the plateau where the new Cathedral was to be built. The river and its banks served a defensive function from here until the end of the 16th century (Roberts 1994).

From the earliest settlement it is likely that any vegetation would have been gradually cleared, particularly on the peninsula side, from the banks.This would have enabled a

clear view of the land below the castle walls, which encircled the whole peninsula.The exposure of the sandstone on the sides of the gorge enabled quarrying to occur and the medieval period witnessed the transformation of the gorge into the more gently banked profile that survives today.

During the 15th and 16th centuries, the river and its banks were employed as a castle moat, a working quarry, an industrial power supply, and also to take sewage away from the city (Roberts 1994).

The period in Durham's history between the reformation in the mid 16th century and the restoration - little over a 100 years later marked the gradual shift away from the old mediaeval order to the new, the dominant duopoly of the bishop and the priory began to decline, civic powers began to develop and a new era of prosperity began.These developments together with general improvements in social conditions, housing and sanitation all affected the appearance of the river banks (Roberts 1994).

The banks below the castle walls were predominantly bare for military reasons, up to the mid 17th century.Engravings of the city, (probably c1664 from Whinney Hill) suggest the banks were still bare, with trees only on the St Oswald's side.The long terrace known as Prebends Walk may first have been laid out this time when the prospect from it would not have been obscured by trees (Roberts 1994).

By the 17th and 18th century the 'greening' of the Riverbanks had begun, only completed in the early 19th century, a sylvan landscape, romantic and picturesque, to set the mediaeval monuments in.The landscape was not a re-creation of the primeval forest, but a deliberate plan to create a place of tranquillity and beauty in the best traditions of English landscape.Design analysis of engravings during the 18th century highlight the gradual afforestation of the banks, particularly on the western side below

the castle and Cathedral. In the mid 18th there were formal gardens extending below the walls at the end of the south bailey, but engravings of 1754 show the western peninsular banks devoid of trees (Roberts 1994).

The Cathedral Prebend, Dr Spence may have been one of the first to begin improvements to the River banks, including paths and tree planting during his residency,1754-68. These improvements, as well as signalling the decline of the Riverbanks former roles, should also be seen as part of the overall fashion for English garden landscape design.The growth of informal natural planting, love of the picturesque, the romantic use of classical buildings and gothic views all have their origins in the early 18th century experiments in landscape design.The 18th century 'improvers'in Durham saw all the components that create the "Romantic" landscape - dramatic site, ancient buildings and water and only found it lacking in trees, the decision to site Prebends Bridge (**Figure 4.16**) at some distance from the old bridge, may have been purely a wish to obtain the best viewpoint for the Cathedral and Castle as part of an unfolding walk around the newly pathed riverbanks (Roberts 1994).

Tree planting on the important western peninsular slopes developed gradually from 1750 to 1825 when they were largely covered, they began to appear on engravings c1777.On the eastern peninsular side there were pockets of trees in1750 but the more gentle slopes here below the walls have been cultivated for orchards etc. and remained as gardens up to the mid 19th century (**Figure 4.17**), their subsequent change to woodland is more as a result of abandonment than deliberate policy. It is possible that the flood of 1771 may have uprooted several young trees on the immediate banks of the river but the majority of the new planting was higher up the slope away from danger (Roberts 1994).

Fig. 4.16 'A View on Durham Banks', an engraving by Bailey (1783) from W. Hutchinson's *History and Antiquities of the County Palatinate* (1787)

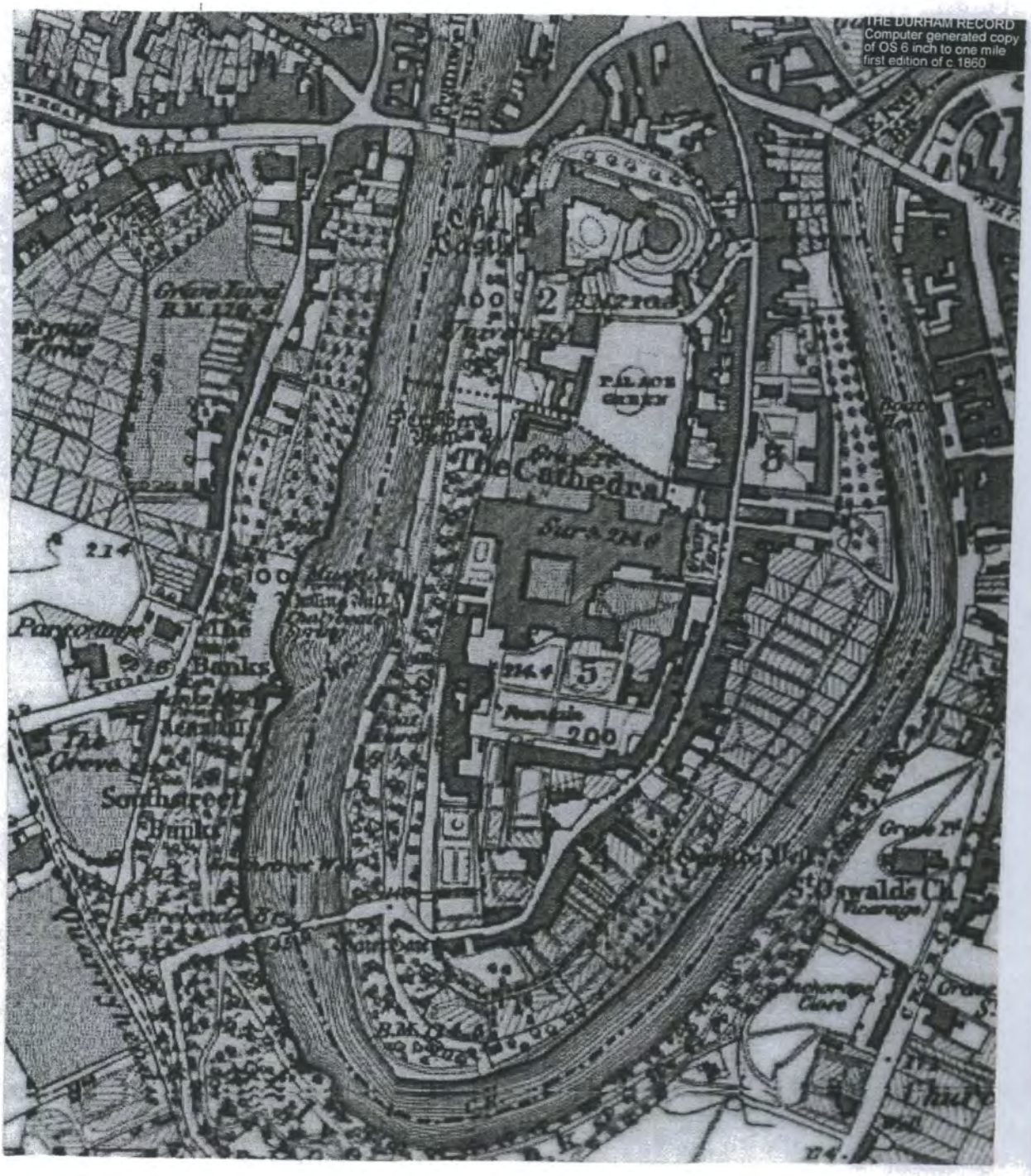


Fig. 4.17 Ordnance Survey map section of 1860, showing the Peninsular and Bailey gardens. The major change on the Riverbanks since the first addition of the O.S. map of 1860 has been the abandonment of the Bailey gardens to naturalised woodland (Durham Record, 1997)

Into this landscape the 18th and early 19th century residents/owners added appropriate features -a classical temple ('Counts House'), a number of wellheads and springs tree planting during this period included both native and non-native species.

Since the 1857 first addition Ordnance Survey Map was produced the major change in the Riverbanks landscape has been the abandonment of the Bailey gardens and orchards to naturalised woodland.

The Dean and Chapter have echoed the landscape parkland tradition evident in the history of the Riverbanks by the erection of two sculptures by the artist-in-residence in 1988, Colin Wilbourn,'stone seat' and particularly 'the Upper Room' have been well received (Roberts 1994).

4.18.2 Current Management

Ownership has simplified to predominantly institutional ownership with all the Bailey properties bar one, coming under the control of the University or one of its two independent colleges, St John's and St Chad's the Dean and Chapter Estate, as successors to the mediaeval priory, has remained unaltered.

Management of the woodland has been vested in the case of the Dean and Chapter, in its Banks Committee and in the University's case, the Horticulture Officer the City Council also owns a small parcel of land behind the Count's House (Roberts 1994).

The Dean and Chapter budget was £40,000, for the river banks (1997).This expenditure was broken up into costs for, tree planting, Fencing, tools, herbicide applications and specialist consultancy work tree surgery -(Houghall College).The

finance is from the Dean and Chapter resources and money generated by public events, such as sponsored walks.

Beech, oak, horsechestnut, sycamore, birch and willow are still dominant on the banks, holly, lime, cherry, sweet chestnut, yew, elm, conifers being the introduced varieties. During the 19th century rhododendrons, bamboo and other exotic species were introduced and these have survived.Tree felling (**Figure 4.18**) is carried out on older, dead or diseased trees, with many of the elms being felled due to Dutch elm disease.

General management of the Riverbanks is usually low maintenance, leaf clearance, grass cutting, but there is some specialist treework done by some of the staff. Work is carried out as and when necessary, although a computer database can be referenced for 'priority tasks'. The priority rating is divided into :-

- Work carried out immediately if the public or surroundings/environment or both are deemed to be at risk by trees or dangerous masonry or other factors -high priority. If there is no danger or perceived danger to the public or surroundings/environment -low priority.
- Priority work depends on, importance, aesthetically, historically and structurally it may also depend on importance of other jobs in relation to time and cost (Foster 1997).

Replanting of trees (**Figure 4.19**) is carried out as an ongoing process in order to maintain a complete and continuous tree canopy on the banks.

Other work undertaken by the Dean and Chapter grounds maintenance staff includes, tree planting, fence maintenance, cutting back vegetation, maintenance of bedding plants, sweeping leaves off paths and cutting flowers for displays in the Cathedral.

For grass coverage a rye-grass mix is used on most of the riverbanks, this is a native mix of rye-grass and this is used in order to maintain a hardy sward, as it gets constant use from visitors to the riverbanks.

Much of the maintenance management is routine and involves clearing litter, mowing the grass, tree planting and tree safety checks which may result in removal of harzardous trees.

Mowing takes place every two weeks from June until September on the most extensive grassed areas, this includes the picnic areas and areas used for general recreation.The borders are strimmed of long grass or weed grass.Grass along the paths is cut short or strimmed up to about a metre from the path edges and left longer over this distance, this area is strimmed several times per year. The grassed areas at the sides of the path (which are the beginnings of the tree line), are strimmed once or twice a year other than that they are left untouched, although small staked trees are planted here when a gap in the tree line occurs.

Fig. 4.18 Tree felling is a necessary practice carried out on the Riverbanks in order to keep the overall stand of trees healthy and for safety purposes

Fig. 4.19 Replanting of old, dead or diseased trees is an important part of maintaining a constant forest canopy on the Riverbanks

- Changes in conditions within the tree line may render other trees more liable to wind throw or wind snap
- Such changes may occur as a result of thinning a group of trees or removing individual trees
- Existing trees will usually need to be supplemented by new planting. This can help to provide diversity of age and can fill the spaces where there are no suitable existing trees. Sufficient space should be left for the future growth and development of this planting

Particularly invasive weeds which occur along the banks are treated with Glycophosphate, (commercially known as 'Roundup'- this herbicide works by targeting and becoming localised around the weed and then taken up and retained. After the weed has been destroyed there are no chemical traces in the soil).This herbicide has been found to be very effective against most weeds occurring along the banks.There is a limited herbicide usage policy in operation to safeguard against danger to the public and particularly families with young children (who are high user groups of the riverbanks) and also to reduce the amount of herbicide that is leached into the river. However weed species which have established themselves on the river banks and include the introduced Himalayan Balsam and Japanese Knotweed are the subject of a spraying regime, started five years ago and carried out by the Environment Agency, this seems to be controlling the spread of these species on the Riverbanks.

Owing to the Riverbanks being a very social and interactive place, both for locals and students, problems can occur, these include fires that have been lit on grass sown areas, particularly near Prebends bridge and some vandalism and damaging of newly planted staked trees, this has been combated with some success with the application of protective mesh and plastic tubes around the trunks (Foster 1997).

The steep banks are also prone to erosion (**Figure 4.20**) and small land slips can occur, usually when it has rained and the soil is wet but also constant quarrying in the past has weakened the slopes and led to subsidence.This results in exposing the roots and causes damage and instability to the trees with the added effect that the trees can become a danger to people. When this happens, depending on the priority given, the tree may have to be removed to another place, if this is practical or it may have to be felled. If this becomes the case, provision should always be made for a new tree to be planted in its place.

Fig. 4.20 Erosion of the slopes caused by a combination of unstable soil, slope steepness and rain can be a major problem in the management of the Riverbanks

Flowers are also picked, particularly daffodils planted on and around the banks, but the grounds staff say this is to be expected and it is rarely noticeable.

There does not seem to be a real problem with litter, with the exception of the odd can or crisp packet as most people make use of the bins which are provided alongside the paths on both sides of the river and at either ends of the peninsula.Only during the summer and when there are events going on, such as the Regatta does a litter problem occur, during this time a litter patrol is mounted by the staff every morning to tidy up.

Involved in helping with the upkeep of the riverbanks are various groups, the Cathedral Camp Group - help with tree planting on the banks, litter collection, footpath renovation and general maintenance of the Cathedral grounds and Riverbanks.

More than 300 different species of flowering plants occur on the River banks, including snowdrops, celandines, wood anemone, wild garlic, cuckoopint, ferns, mosses, lichens and liverworts have all become established, as well as birds, such as great spotted woodpeckers, tawny owls, tree creepers, nuthatches, chaffinches, redwings, wrens and bats such as pipistrelle and Daubenton's bat. Members of The Durham Wildlife Trust and Durham Bat Group have put bird and bat boxes up and the Durham Wildlife Trust monitor and trap grey squirrels, as they are efficient bark strippers of broad leaved woodland and can irreparably damage newly planted young trees.

One problem that is difficult to overcome on the riverbanks lies with the fact that the riverbanks in Durham are almost enclosed areas of countryside and this cover provides the real possibility of being attacked, or more specifically, raped, these areas are numerous along the river banks.

The problems of overall management of the Riverbanks not just in terms of replanting of a high percentage of mature/overmature trees, but also problems of access, litter, lighting, attacks etc led to the establishment of the Riverbanks Management Group in 1991.

4.18.3 Future Management

Tree work on the riverbanks is subject to strict planning control and should only be carried out when absolutely necessary. Problems with felling and extracting timber on such an inaccessible site will mean that any work will incur high costs.Checks should be made that the University actually owns the trees in question before any felling is carried out. Great care should be taken to inform local newspapers and residents to gain a positive appreciation of the tree work.The main concern on the riverbanks over the next five years will replanting of be old, dying elms and the difficulty with which young beech and oak have in establishing because of the problem of vandalism.

4.18.4 Recommendations

These are mostly recommendations to reduce the possibility of Rape/Sexual attacks:-

- Having tree free zones on some parts of the peninsula.
- Possibility of better lighting along the peninsula, (lighting will need regular maintenance).
- Employing staff to patrol the River banks.
- Signs to warn students/ people to travel in groups especially after dark around the peninsula.

- Increasing the profile of the Durham Wildlife Trust, by using information on fauna and flora of the riverbanks and also historic information of the area.
- The installation of CCTV cameras, particularly around the Prebends bridge 'area' of the Riverbanks.

4.18.5 Summary

The Riverbanks in Durham are one of the most important green space habitats in Durham City as well as providing an amenity for recreation and activity, they are also aesthetically pleasing They are popular with tourists (of which Durham's economy is dependent upon), as well as local people. More importantly they provide continuous linear green tracts throughout the city which provide a facility for the movement of wildlife.

The Millennium Project for the City of Durham,1997, also includes plans to improve areas of the Riverbanks, within the peninsular.

4.18.6 The Environment Agency

The Environment Agency was established in 1996. It is an independent public body with wide-ranging responsibilities for controlling air, land and water pollution, and for managing the water environment in England and Wales.Through a combination of regulation, best practice demonstration and partnership with others, the agency is working towards a better environment for present and future generations.This includes promoting the conservation of wild animals and plants that live in or near the water environment.

The Environment Agency assists the City Council/Dean and Chapter/University of Durham in maintaining the River Wear and its banks (Wilson 1997).

4.19 Woodland

The Forestry commission has defined woodlands as two main types, these are:-

- Woodland areas - these are usually in excess of 0.25 hectares.
- Amenity plantings - these are usually in excess of 0.25 hectares and under.

4.19.1 Ancient woodland and urban Amenity woodland

Urban woodlands can be made up of ancient natural woodlands, where protected in the past and used for hunting in by their owners have survived as a whole or in part, up until the present day and are currently used by the public. There may also be more recent woodland either planted in this or the last century or in the last fifty years and used as a main amenity by local people. Trends show that Amenity woodland plantings are increasing, while natural woodlands have been decreasing since 1978. Noteworthy features are that there is an unprecedented wave of recent amenity planting in towns and the unexpected scarcity of spontaneous secondary woodland. While most rural woods can be pigeon-holed into such a classification, it can be more difficult with urban ones as they have often experienced more disturbance and consequently show greater complexity (Gilbert 1989).

Urban Amenity woodlands are usually in close proximity to housing and consequently experience a high level of public use; they are criss-crossed by paths, used for adventure play grounds by children, and many receive a considerable input from the local authority. They form a continuum with the more extensive woods to be found at the city limits.

Key factors characteristic in any woodland are its age and origin which provide a convenient framework within which to examine urban woods.

Survival of ancient woodland through a phase of urbanisation is determined by combinations of topography, ownership and chance. Some of the most heavily wooded cities in Britain are those containing slopes too steep for easy development, for example Newcastle upon Tyne, the deep ravines of Jesmond Dene, Scotswood Dene and Castle Eden Dene at Peterlee, all carry high-quality woodland well into the inner suburbs.

Ownership provides the surest protection against development. The most extensive ancient urban woodlands, are those bought by or presented to local authorities to be managed for public amenity, (e.g. Pelaw Wood), on the outskirts of Durham (**Figure 4.21**).

Owing to a new awareness of the amenity and nature conservation of ancient woodland, the rate of deliberate destruction, particularly in urban areas, is likely to remain very low. Occasionally, however, a local authority may still want to build on one of their woodland holdings.

Many chance phenomena operate both to preserve and destroy woodland in urban areas. The survival of odd corners and strips cut off during the construction of railways or roads can be locally important when larger areas have disappeared from the picture but clearance is not the only hazard facing ancient woodland in towns and cities, the effect of inappropriate management can also have an affect. The introduction of non-native species is an important point and in a woodland where the primary object of management is general amenity, so planting small amounts of larch

Latrix decidua or Roble beech *Nothofagus obliqua* - specifically to replace dead elms

Fig. 4.21 Pelaw Wood (Grid Ref NZ 286424) a good example of an ancient natural woodland in Durham City

is acceptable. Only in the most natural woods is there an embargo on exotics and even here the situation is complicated by the presence of the long-established hornbeam *Carpinus betulinus* and alder buckthorn *Frangula alnus* both believed to have been introduced originally but now regarded by local botanists as 'established' (Gilbert 1989).

Ecologists tend to distinguish between *primary* (continuously covered and *secondary* (recolonised) sites, and conservationists attach an especially high value to the former: the terms ' primevial woodland' or 'wildwood' are commonly used. Peterken (1981) notes that primary woodland is a useful hypothetical concept rather than an identifiable state, and prefers to draw a distinction between ancient and recent woodland, with a threshold date around AD1600. An important countryside designation in Britain is now that of the Ancient Semi-Natural Woodland (ASNW).

Most ancient woods in urban areas have experienced some 19th and 20th century invasion by or planting of exotic trees such as larch, Scots pine, sweet chestnut, beech (in the north) and rhododendron, but contain a preponderance of locally native species.The shrub and ground layers tend to be more resistant to invasion by exotics. In some instances it has been recognised that rough grassland adjacent to a wood is important both visually and ecologically; steps are then taken to redraw the wood boundary so as to include these ecotones. Further steps then need to be taken to see that they do not get planted up.

Only occasionally is there a polarisation of view in management of amenity woodlands, between managers with a forestry training who view woods as requiring substantial management and the ecologists/naturalists who believe that amenity woodland should be largely self-maintaining. Foresters believe that no trees should be allowed to grow till they fall naturally (although in a well used woodland this could be potentially dangerous), and have suggested a rotation for amenity woodland about a third longer than for a commercial crop, beech, ash and elm 100-120 years, oak 120-150 years. They particularly favour taking out decrepit trees and those in decline. Much is made of the point that natural regeneration often fails because it does not get the care and maintenance essential for survival. The neat and tidy and predictable woodland which results from this approach appeals to the local authority members because they have a legal responsibility to keep the woods safe for the public and are liable to be sued if an accident occurs.

Ecologists/naturalists see woodland in a constant state of change and are aware that the degenerate stages of woodland, such as old trees and glades, are a natural succession and would prefer to see parts of the woodland grow through to senility and

decay. If the long view is taken, woods are self maintaining, though generation can be slow and sporadic.

Amenity woodlands can be zoned with not to much difficulty, whereby remoter parts of the wood are set apart for wildlife areas and scheduled to receive a minimum of management - an appearance of naturalness is itself an amenity.

4.19.2 Secondary urban woodland

Secondary woodland that has developed from natural regeneration on bare ground over the last few centuries or so is not particularly common in cities where new woodland, if required is usually planted. The best examples occur on neglected sites such as abandoned allotments, railway land, old cemeteries, strips beside rivers and on ground found to be too steep or wet.

The development of the ground flora of secondary urban woods is a continuous process, as it is unlikely to be left undisturbed sufficiently long for any kind of stability to be attained. Species often show a patchy distribution around the original site of colonisation which imposes a low density on individual sample plots, even though a list from the entire wood might be quite long. This contrasts with the ground vegetation of ancient woods which tend to be an intimate mix of species, the distribution of which is controlled rather precisely by soil factors, past management and the light climate.

4.19.3 County Wildlife Sites

County Wildlife Sites are sites that are of considerable nature conservation or geological interest but do not have any international or national designation but are

nonetheless important at the County or local level These Sites of Nature Conservation Importance (SNCI's) which have been identified by the County Council, include Hopper's Wood (Site No. 4.11), Pelaw Wood (4.10) and Houghall, Maiden Castle and Little High Woods (4.23), Local Nature Reserves (LNR's), (Low Newton Junction nature reserve) which form managed habitats of conservation value and public interest and Regionally Important Geological/ Geomorphological Sites (RIGS) identified for their scientific and aesthetic value. SNCI's include sites identified by the County Council as either County Wildlife Sites and County Geological Sites. It is therefore important that strategic policy recognises the need to safeguard such areas Policy 67(C).

Policy 67 (C) states :-

- *Ensure that the nature conservation interest of regionally or locally identified sites will be safeguarded from adverse development.*

4.20 Woodland in Durham City

4.20.1 Hoppers Wood (Grid Ref NZ 275440)

4.20.2 Background

Hoppers Wood is situated to the north of Durham City it is a fragment of ancient woodland, formerly part of Frankland Forest, which was owned by the Bishop of Durham and for which records date back to the 15th Century (Standen 1991).The site is broadly linear in shape, orientated in a roughly north-south direction and has an area totalling approximately 13 hectares. It is positioned on the urban fringe and is flanked by housing to the north (Newton Hall), a railway line to the north-west, agricultural land to the east, and light industry to the south.The land is owned by Durham County/City Councils.

4.20.3 Current Management

Hopper's Wood typifies a number of riverine woodlands in the vicinity. The site has conservation importance as an ancient woodland and County Wildlife Site and is thought to have once formed a section of the extensive Frankland Forest. The wood itself is in a relatively steep valley.The woodland is part of an ancient woodland which was managed historically but appears to have undergone little management in recent times; it is relatively undisturbed and contains a significant amount of old and dead wood (**See Appendix 8 for target notes and species list**).

4.20.4 Future Management

Hopper's Wood forms part of a declining patchwork of woodland fragments. It could thus potentially form an important wildlife corridor, or a reservoir of woodland species to help maintain other woodland patches in the wider area. Just as importantly, the site is close to urban areas (e.g. Newton Hall) and could form an important urban wildlife site.The importance of such sites in education and raising public awareness is paramount. A study commissioned by Durham County Council expressed concern over a number of environmental issues in the area, including walking and butterfly and frog populations (**see Appendix 9**).The study was part of a range of initiatives by the County launched as part of a Local Agenda 21 campaign. (Robinson et al1997).

4.20.5 Recommendations

Management of Hopper's Wood should therefore not only take into account wildlife conservation issues, but also consider issues such as:-

- Ease of public access.
- Aesthetic appeal (e.g. a number of streamside areas churned up and muddy; nearby factories and sewage works).

- Noise pollution (nearby garage; railway line).
- Hazards (e.g. factories, railway line).

Management for this purpose would be likely to include:-

- Installation of additional footpaths/walkways to facilitate access to various parts of the site while encouraging the public not to trample the vegetation underfoot.These could form a circular walk around the site. Link up with access points from the north and south, and possibly form part of a larger walk around the area.
- Educational (vandal-proof) signboards at the site entrances and specific interest areas.
- Signposts on main roads/paths near site entrances.
- Publicity by the local council/encouragement of local schools to use the site for education.
- Possible involvement of local residents, businesses, schools etc in conservation, e.g. helping with pond management and tree planting.

4.21 **Houghall Wood** (Grid Ref NZ 280406)

4.21.1 Background

Situated on the south eastern edge of the Durham 'Bowl', Houghall Wood offers a good example of 'fringe woodland' in a city.There is a small parking area located just north of Shincliffe Bridge. Access into the wood is by way of the main footpath.

4.21.2 Current Management

The wood contains a range of habitats for both plants an animals with the steepest valley sides being covered with mixed woodland, the main species being beech, oak, sycamore, birch and elm.There are also small areas of European and Japanese larch plantations.The valley bottom is mixed farmland with small areas of land given over to plantations formerly associated with mining. Along the river banks there are patches of scrub and in summer, fairly verdant plant growth occurs, the area also contains the earliest example of pit reclamation in County Durham which was carried out in 1928 with mixed tree planting. Old railway embankments and bridge abutments still remain.

4.21.3 Fauna

In the woodland a range of typical species can be seen, sparrowhawk, woodcock, green and greater spotted woodpeckers, nuthatch, blackcap, garden, willow and wood warblers, chiff chaff, redstart, willow tit and jay (Durham Bird Club 1997). Occasionally in winter brambling feed under the beeches.The coniferous plantations hold goldcrests, redpolls and sometimes siskin.

Along the river, little grebe, common sandpiper, sand martin, white throat, sedge warbler, reed bunting occur regularly. Less frequently heron, cormorant and oystercatcher. In winter there are goldeneye and goosander.

In addition to the birds there are also Roe deer, Red and grey squirrel and badgers which are all resident.

4.22 Flass Vale/Shaw Wood (Grid Refs NZ 263426, NZ 266427)

4.22.1 Background

Situated to the west of the city centre, Flass Vale/Shaw Wood are parts of the same Woodland, (although Flass Vale is generally known as the marsh area below Shaw

Wood). Although there are several points of access the most convenient one for visitors is from Waddington Street, (Grid Ref NZ 268428), which leads to the bus garage. Immediately on the right hand side of the bus garage is a footpath which leads directly into the Vale. It is normally possible to park in Waddington street.

4.22.2 Current Management

Flass Vale is a popular public space with local people. The steeply sloping sides of the Vale form a 'bowl' from which there are good views towards the Cathedral.The vegetation is a mixture of mature trees of many species and an area of younger oaks on one of the southern slopes.Thick hawthorn scrub provides good cover for animals and there is an extensive patch of gorse on the north side. Additional variety is provided by small areas of open grassland and marsh habitat along the stream in the valley bottom.

The most conspicuous flowering plants are gorse and bluebell, the latter towards the north west end. Among other species which occur, are northern marsh orchid. Throughout the year the vale and wood holds a good selection of woodland birds (**Figure 4.22**).

4.23 Pelaw Wood (Grid Ref NZ 285424)

4.23.1 Background

Pelaw Wood is an ancient woodland site of about 15 hectares, owned by Durham City Council it contains mixed deciduous woodland occupying the steep slopes of the valley alongside the River Wear, it is also designated as a County Wildlife Site (No.4.10). The woodland is reasonably well structured although the shrub layer is not

particularly well developed. Pedunculate oak *Quercus robur* is the most abundant tree but there is also a considerable amount of sycamore *Acer pseudoplatanus* and beech *Fagus sylvatica* present together with a small number of wych elm *Ulmus glabra.* Shrubs include hawthorn *Crataegus monogyna*, blackthorn *Prunus spinosa* and holly

Common Name	**Latin Name**
Great Spotted Woodpecker	*Dendrocopos major*
Jay	*Garrulus glandarius*
Kestrel	*Falco tinnunculus*
Coal Tit	*Parus ater*
Blue Tit	*Parus caeruleus*
Great Tit	*Parus major*
Long-tailed Tit	*Aegithalos caudatus*
Chiffchaff	*Phylloscopus collybita*
Willow Warbler	*Phylloscopus trochilus*
Blackbird	*Turdus merula*
Fieldfare	*Turdus pilaris*
Mistle Thrush	*Turdus viscivorus*
Song Thrush	*Turdus philomels*
Robin	*Erithacus rubecula*
Grasshopper Warbler	*Locustella naevia*
Wren	*Troglodytes troglodytes*
Pied Wagtail	*Motacilla alba*
Magpie	*Pica pica*
Nuthatch	*Sitta europaea*
Chaffinch	*Fringilla coelebs*
Greenfinch	*Chloris chloris*
Starling	*Sturnus vulgaris*

Fig. 4.22 Bird species recorded at Flass Vale/Shaw Wood (Compiled by Durham Bird club 1997).

Ilex aquifolium. The ground flora is varied with dog's mercury *Mercurialis perennis*, wood anemone *nemorosa*, lesser celandine *Ranunculus ficaria* or ramsons *Allium*

ursinum which are locally dominant.The site has an underlying geology of Coal Measures, a substrate of soft brown earth, its altitude is 70-75m OD (Ordnance Datum) and its aspect is south-west facing.

4.23.2 Current Management

Pelaw Wood is used as an Amenity Woodland and is very accessible to the public. It is an urban wood and is almost surrounded by housing.

The wood is of particular interest in that it contains wood vetch *Vicia sylvatica* and wild liquorice *Astragalus glyphyllos* both uncommon in County Durham.The wood is of great landscape value due to its proximity to Durham City. It is heavily used for recreation, particularly by children and is somewhat degraded as a result (Surveyed by V Standen in April,1990) County Wildlife Site Target notes accompany the survey (**Appendix 10**).

4.23.3 Future management for Woodland in Durham City

Trees and woodlands are valued components of Durham's landscape and provide many varied habitats for wildlife, create opportunities for recreation and access to the countryside, furthermore, tree planting can be an effective tool of landscape renewal. New woodlands can provide many benefits and make effective use of degraded urban fringe land.Measures to increase the coverage of native broadleaf species could make a significant contribution to the County's landscape and nature conservation interest. While the planting of new woodlands is generally encouraged, there may be circumstances where woodlands or tree planting would not be appropriate, for example where it would affect areas of established nature conservation interest or heritage features.

In a national initiative led by the Countryside Commission and the Forestry Authority, major new community forests are being developed on the edges of the Regions conurbation's. The Great North Forest has been established in the South of Tyne and Wear and in North Durham.The Cleveland Community Forest borders the County in the south-east. These Community Forests are principally land management projects aimed at a new vision of the countryside.There are also opportunities to create local community woodlands through environmental improvement initiatives elsewhere within the County.

As well as encouraging new planting, there is a need to sustain and manage Durham's existing woodlands. In particular, mature deciduous woodland is probably the richest and diverse habitat type in Durham, having taken many hundreds of years to develop its complex interdependent community of plants and animals and this is acknowledged in Policy 69 of the Durham local plan.

English Nature produced a provision inventory of ancient woodlands in the County in 1987, which indicated that only 4117 hectares of ancient woodland, continuously wooded since 1600, now remain in County Durham. Once lost, an ancient woodland can not be recreated and no amount of new planting will compensate for its disappearance (County Durham & Durham City Local Plan 1995).

Policy 69 states :-

> *An increase in tree cover in the County will be sought where there are no significant adverse impacts on the character of the landscape, nature conservation interest or heritage features.*

4.23.4 Recommendations

- Though the planting of woodlands does not require planning permission, local planning authorities are consulted by the Forestry Authority on planting proposals and seeking grant aid.

- Planning authorities can also encourage woodland planting as an after-use in the reclamation of mineral workings and derelict land and can promote tree planting within other forms of development.
- Local plans can encourage the planting of woodlands, particularly where it would assist with the development of Community Woodland.
- Ancient riverine woodlands contain, an important habitat in them, known as Streamsides. Streamsides should have thriving natural bankside vegetation to minimise erosion and project water quality. In unplanted streamsides, open spaces should be irregular with the edges designed to link across the space at key points.The aim should be to have an irregular distribution of waterside broadleaved trees, so that about 50% of the stream is in full sunlight, the rest receiving dappled shade.

4.23.5 Treeshelters

Planting trees in rigid translucent plastic tubes enables individual trees to be established quickly. Even when used with care, they appear very artificial, particularly in large numbers.Temporary fencing to exclude browsing animals and correct herbicide treatment to secure rapid early tree growth is cheaper and looks better on larger areas.

Shelters are best used to establish small groups of individual trees and should:-

- Be of an unobtrusive colour, to blend with surroundings. Russet brown's or olive greens are usually best. Avoid white or garish greens;
- Be positioned in irregular fashion, not in geometric patterns;

- Be well staked and securely erected. Leaning shelters give an impression of dereliction and incompetence.
- Residual stakes and decayed plastic should be cleared away when they are no longer required by the trees.

4.23.6 Species pattern

The species pattern can reflect the broad pattern of the landscape, the pattern of ground vegetation, or the local landform which will become hidden beneath the tree canopy. It is best to follow whichever is the more dominant in the landscape.

In the initial planting of bare land, species layout should fit the shapes of well-designed external margins and open space. One species should appear to dominate the landscape composition by about two-thirds.Though contrasting species bring diversity, too much variety appears confusing. Different species mixed intimately disappear into an overall pattern or texture and need to be treated as a homogenous element in forest design. An overlapping and interlocking pattern of a few contrasting species, in scale with the landscape, gives better overall unity.

The mixing of species at a common margin should be done by planting a few groups and individuals of one species within the mass of the other, or by extending groups and single trees of each into the other. (Forestry Commission Guidelines, 1994).

4.24 School grounds

4.24.1 Introduction

School grounds are vitally important outdoor spaces in what is perceived to be an increasingly dangerous society. School grounds are recognised as one of the first public landscapes in which young people spend a significant amount of time. For most

children they are the first public outdoor environment by which they have any sustained experience, attitudes towards people and places are formed by this experience.

4.24.2 Education Act of 1944 (revised 1988 and 1991)

The Education Act of 1944 (revised 1988 and 1991) has a clause to accommodate for moral, social and cultural subjects, this is so the changing diversity of the curriculum can be taken into account.The Environment, could be classified as one such subject, as it fulfils the criteria of involving moral, social and cultural subjects.

4.24.3 Environmental Education as a curriculum subject

- Umbrella subject.
- Environment is a 'lifestyle' subject, relevant to modern life.
- Environment subjects create responsibility.

The environment could be called an 'umbrella' subject, as it can be adapted to traditional core subjects, such as maths, science and English easily, (e.g. taking maths as the core subject and an exercise with an environmental factor such as climate statistics, in the present primary school curriculum, this would be incorporated into mathematics, key stage 2, Developing and Handling data).

The importance of the environment is a subject relevant in the modern world and if expressed at school can teach children how they can contribute positively to their immediate surroundings or globally, and so become responsible for the world around them.

4.24.4 Schools and Agenda 21

- Rio Earth Summit 1992
- World Agenda 21
- Local Agenda 21
- Relevance to school curriculum.

The involvement of schools enables a large number of children and adults to contribute directly to local agenda 21, and will also encourage community involvement in the process. In addition, schools have the expertise needed to measure and record information on crucial environmental issues. Much of the Local Agenda 21 work links easily into the National Curriculum and can help develop the personal and social skills of children through participative exercises. It can also help to raise awareness of environmental issues, offering an opportunity to tackle these directly in a hands on way.

4.24.5 Summary

- Environmental education in schools teaches children to become, more aware of their surroundings, both locally and world-wide, through knowledge about the subject.
- Helps them realise that they can have some effect on the environment and so act responsibly.
- Environmental education in schools incorporated into the curriculum, teaches the extent of the subject and how it can affect everyday life.

4.25 School grounds maintenance and contractors

- School grounds maintenance is the day to day care of all aspects of the school grounds to an agreed standard and in an agreed way.This work and its organisation are only part of the larger task of school grounds management.
- School's grounds management is concerned with the larger term planning and policies and organisation of site use development and maintenance.

The Local Government Act of 1988 defines grounds maintenance as :-

- The cutting and tending of grass (including returfing and reseeding but no initial turfing).
- The planting and tending of trees, hedges, shrubs, flowers and other plants (but excluding new landscaping works).
- The control of weeds.

The Local Government Act of 1988 requires that contracts for grounds maintenance be put out to tender at regular intervals, except for voluntary aided schools, (where the staff are employees of the governors rather than the Local Education Authority (LEA). Small schools (with three or fewer full-time equivalent staff undertake grounds maintenance and cleaning work combined).

This legislation was introduced to ensure that local authority staff should only be allowed to undertake grounds maintenance provided that their costs for doing so were competitive with commercial contractors and so to ensure that schools get value for money.When the new legislation was brought in most local authorities, for a variety of reasons both financial and managerial, decided to include broadly the same areas of work in grounds maintenance contracts as had been previously carried out by their

own Direct Services Organisation (DSO), also sometimes called Direct Labour Organisation (DLO). For schools and the majority of local authority grounds staff, this has resulted in fundamental changes in their relationship with schools.The most important aspect of this has been that the work is now precisely specified, quantified and authorised, usually before it has started.

In addition to the Local Government Act (1988), the Education Reform Act, (1988) has resulted in a change in the financial arrangements for grounds maintenance. Each school now has a specific budget, produced by a formula, allocated for grounds maintenance. Budgets for school grounds maintenance are allocated according to formulae which can vary between LEAs most are based upon pupil numbers with additional funds reflecting the actual costs of maintenance prior to the introduction of CCT or the costs of maintaining the features present on the site. Differences in budget allocation may also exist for the voluntary aided and church schools, Grounds maintenance in independent schools remains the responsibility of the school.

For most Grant Maintained schools, the budget allocation for grounds maintenance is part of the Annual Maintenance Grant (AMG).This is calculated and identified using the same formulae and headings as used previously by their local authority. For grant maintained schools funded under the common funding formulae, a budget for grounds maintenance will have been included but may not be specifically identified.

Schools have been able to improve the quality of their grounds maintenance for no extra cost or even reduce costs simply by being more aware of how their maintenance is organised and improving the efficiency of this. However, simply stopping certain maintenance or reducing the level of supervision can result in long term problems on site which may become a health and safety hazard and may cost more to repair than to

continue maintaining.

4.25.1 Regulations and legal issues

With respect to the outdoor environment there is an obvious need for schools to be aware of the toxic nature of certain paints, timber preservatives and plants. Ideally, future maintenance and possible risks associated with any new or renovated feature should be considered at the design stage and action taken to ensure safety by planning appropriate maintenance throughout. Similarly, when materials such as second-hand timber or garden plants are offered, schools need to be able to quickly establish if they will be a health and safety or maintenance hazard in the future.

4.25.2 Herbicides

Use of contractors, skilled in handling and applying herbicides, is likely to be a sensible option for many public and private organisations, including schools.There are already moves in this direction, in future public resistance may prove to be the strongest obstacle to the implementation of chemical grass maintenance. In recent years there has arisen suspicion of the use of chemicals in the environment. Health and safety requirements mean that the operators are frequently dressed like spacemen even if the chemical in it's diluted state is confidently felt to be harmless. Strong reactions can be expected to any regular application routine in public places.

4.25.3 Environment Protection Act 1990

Apart from the obvious benefits of having a litter free site, schools now have a responsibility to control litter on their school site.(An Information leaflet about how schools are affected by the Act and how they can tackle litter is available from the County Council).

4.25.4 Food and Environment Protection Act 1985

The food and Environment Protection Act was introduced to limit the variety of pesticides used so that only approved substances could be used for specific purposes and applied in specified ways. Pesticide users are now obliged to safeguard the environment, including all living animals, plants and prevent pollution, particularly of water courses and individuals who apply such pesticides need to be certified as competent and trained in this area of work.

4.25.5 Control of Substances Hazardous to Health (COSHH) 1994

Introduced under the Health and Safety at Work Act, (COSHH) requires employees and others responsible for pesticide treatments (such as weed, moss or algae control in soft landscape areas or on hard surfaces) to assess the health risks, and then prevent or control the exposure of those applying pesticides and others to those risks.

4.25.6 British Standards

The British Standards Institution is the independent national body responsible for preparing British Standards. British Standards represent the United Kingdom view on the standards to be achieved in a variety of areas of work. Although compliance with a British Standard does not of itself confer immunity from legal obligations, some ground maintenance organisations and contracts now refer to these documents.These standards represent good practice and may be referred to in any court case following an incident. Compliance with the relevant standards can be taken as evidence of the school's positive approach to safety. The British Standard for Grounds Maintenance is BS 7370 and is in 4 parts:-

- Part 1: Recommendations for establishing and managing grounds

maintenance organisations and for design considerations related to maintenance.

- Part 2: Recommendations for maintenance of amenity woodland.
- Part 3: Recommendations for maintenance of amenity and functional turf (other than sports turf).
- Part 4: Recommendations for maintenance of soft landscape (other than amenity turf).

4.26 Durham Johnson Upper School (Grid Ref NZ 261428)

4.26.1Background

Durham Johnson School is made up of two sites. The lower school site (known as the Whinney Hill site) and the upper school site, located near Neville's Cross.

The site looked at in the study is situated in the Neville's Cross Area of Durham and part of the school grounds are on the site of the Neville's Cross battle of 1346, from which the area gets its name.

Tree planting has taken place on both of the Lower and Upper School sites by staff, notably Mrs Bowen (Head of Geography) and by the grounds maintenance contractors, Brophy's, in accordance with the wishes of the school. About 100 trees and 500 flowering bulbs were planted between the two sites about five years ago.The Upper School site also has plans for an 'ecohouse' to be sited in the grounds, this is to be a study classroom aid for teaching environmental and biological science and will contain flora and fauna for short term study, it is also to be used inconjunction with the wild area and pond already on the site.This area was planted two years ago to create a wetland habitat using marsh plants and a polythene sheet to retain moisture but has since become overgrown with dominant weeds, (Yorkshire Fog, meadow

grass, ragwort and dandelion), the site is currently under study in an effort to develop a management plan. At the Lower School site there is already a wildlife garden used also as a study aid and to introduce children to natural history.Grounds maintenance of the site consists of contract work by County Council approved contractors.

4.26.2 Current Management

The site at Whinney Hill has a wildlife garden and trees are planted there regularly, some by the children. Herbicides are only used as and when is necessary and strictly to correct application, as health and safety procedure has to be observed at all times.

The Durham Johnson site has large areas of playing field space and most of this is economy mown except the far grass banks which are left uncut.The grass is mown in summer, by a Tractor-towed gang mower. Cutting of the grassed areas is carried out 19 to 20 times per year, and it is also rotary mowed every 3 to 4 weeks.(During May and June, grass cutting is only permitted when exams are not taking place, as it is a distraction to the pupils). After being cut, the grass is gathered and tipped - this is expensive and another way, might be to give or sell it to a local farmer to be used as silage or recycled for use in green mulching, (the green waste is shredded, composted and reused as garden compost, soil improver and compost for tubs and hanging baskets).

Areas designated for wildlife in the past have been mown by accident through lack of communication with the school and the contractors. A 'leave alone' clause in the contract for these 'designated' areas could stop this happening again.

4.26.3 Durham Schools ground maintenance Budgets

- 25 per cent of budget spent on grounds maintenance, (Benchmark figure £3.073). 75% spent on teaching materials.

Most of the schools in Durham City, (Durham Johnson, Whinney Hill, Durham School and the Chorister school) currently use the contractors Mitchell and Strothers, (a school which opts out of a County Council run contract can be taking a financial risk as it may be more expensive to employ an independent contractor). The contracts usually last three years with an extension to four years and schools can amend or end the contract after this time and sign up with another contractor if the work done is not satisfactory. Schools are delegated a budget, by the Local Authority, (Charles Mercer, Durham County Council's School ground's maintenance contracts supervisor and budgeting officer oversees this process in Durham City). Out of the budget, it is up to the school how much they spend on education and how much on grounds (usually money allocation is based on pupil numbers) and the Local Authority may advise as to how much each school should spend on grounds maintenance, last year approximately 50% was spent by all the schools in County Durham on ground improvements, (**Figure 4.23**).

The school ground's maintenance contracts and budgeting officer is also responsible for delegating money, for different types of ground's maintenance in schools.This includes, soft landscaping, grasslands, bedwork, wildlife, hard porous surfaces, sports

Primary Schools
(1997) delegated £755,550 of which £425,604 spent on grounds maintenance.
Secondary Schools
(1997) delegated £791,775 of which £302,402 spent on grounds maintenance.

Fig. 4.23 Figures for total budgets received by primary and secondary schools from the Local Authority and the amount spent on grounds maintenance, (1997)

areas, running tracks and small amounts of woodland, but does not include tarmac areas (**Figure 4.24**).

4.26.4 Future management

In general schools are being encouraged and supported to increase the use they make of their sites for teaching. School grounds have become the focus for lessons in every subject area and therefore there may be an increased need for teachers to be aware of school grounds maintenance procedures in order to ensure their needs are catered for.

Any grounds maintenance agreement should have a mechanism whereby information about the need for changes in maintenance requirements can be conveyed between the school and the group responsible for doing the work on site. For example it may be desirable to stop mowing an area of grass because of experimental work or because of excessively wet conditions.

The current moves towards greater pupil and school community involvement in the development of school grounds are to be welcomed as it allows the users to be involved directly in decisions which will affect them.However schools need to be aware that all plans for change and development will affect routine grounds

Amendments to school premises 1996 regulations.

Primary schools changes, (not a standard with all authorities)

- Both playing fields and hard areas 20p per square metre. Must have statutory minimum of hard and soft rec area. Anything over minimum 5p per square metre.
- The allocation of 5p is based on the number of pupils at 4.077p per pupil
- Unspent allocation can be carried over to the next year.

Comprehensive schools changes

- Hard and soft playing surfaces are allocated 13.51p per square metre with an excess of 3.38p. An allocation of 8.294p per pupil
- In addition the Local Education Authority (LEA) retains financial maintenance of mature trees with a girth over 300mm.
- Major pitch refurbishment's and drainage. Boundary fences are also paid for. In general LEA pays for anything over £100.

Fig. 4.24 Changes and budget allocations for primary and secondary schools (1996)

maintenance and so will require to be integrated into the maintenance programme. Indeed, this may involve a formal notification and negotiation procedure if grounds maintenance is currently being managed under contract.

Many schools have made significant changes to their sites and intended that pupils and parents will maintain the new feature only to find that time and curriculum demands, as well as the changing pupil and therefore parent population, mean that maintenance is allowed to fall behind. Suddenly,what was intended as an asset and a resource has become an eyesore and even a hazard for health or safety. Maintenance,

therefore, needs to be considered at the very beginning, and organised and budgeted for accordingly.

4.26.5 Recommendations for 'Wildlife Designation Areas'

Some new planting and some wilder areas will, inevitably and intentionally look unkempt, it may be useful to signpost this clearly so that everyone is aware of what is being done. Careful design which takes account of the current numbers and types of site users and site use may, in the short term, seem expensive but in the long term will bring the benefits of easier and therefore cheaper maintenance, reduced repair bills associated with the provision of a good quality environment.

By planting more trees, this would have a two-fold benefit, school grounds would encourage wildlife and also save on grass cutting costs.

4.26.6 Summary

School grounds vary in both size and type. Some schools have only small tarmac yards for four hundred children, while others have several hectares as well as tarmac areas for the same number.This occurs irrespective of location, with many rural schools still having all tarmac grounds. In the last few years there has been a large increase in the diversity of school grounds with wildlife habitats such as ponds, woodlands, trees and meadows being created as well as seating and quiet recreation areas and specific curriculum resource areas.

In addition to the extraordinary growth of interest in school grounds, there have been changes in all aspects of the management of schools.Traditionally the local education authority was responsible for the overall management and maintenance of the school grounds.Today many schools have opted to take responsibility for organising their

own site development and maintenance.

Although there is now widespread agreement that school grounds can be a valuable asset, grounds maintenance practices have not always been completely in harmony with the educational requirements of the curriculum. Schools in seeking to determine objectives and strategies, need to recognise and reconcile the value of the grounds in terms of their educational purpose and their responsibility to protect the school environment with a restricted budget.

4.27 The Wildgarden Project

4.27.1 Introduction

Chris Bains, in his book ' The Wildlife Garden'(1985) has said:-

> *A wildlife garden without a pond, is like a theatre without a stage - the garden provides an area for wildlife, but it is at the edges of ponds that wildlife interaction occurs. Anyone who has sat by a pond for any length of time, will have seen, a miniature world going on before their eyes, the sedately snails grazing algae, whirligig beetles buzzing about on the surface, diving beetles hunting in the pond weed and the aerobatic displays of the dragon flies skimming the water's surface* (Bains 1985).

Ponds provide a chance for children and adults to become more educated about the environment and see the natural world in action. They also provide habitats for wildlife. Wetlands and ponds in towns and cities, have proved more than anything else, that urban conservation can provide some positive compensation for habitat destruction in the countryside. The common frog in particular would be virtually extinct by now if it were not for ponds in the suburbs and the same could be said for diving beetles, damsel-flies, pond skaters and other species that rely on small stretches of unpolluted shallow water for survival (Bains 1985).

4.27.2 The Wildlife Garden

> *At the primary stage environmental education is seen as involving pupils in personal experience by direct exploration. Such environments will involve school gardens. Teachers are expected to use these experiences to develop language, numeracy, scientific methods of enquiry, aesthetic appreciation and creative expression.*

(extract from "A statement of aims for the formal education service - National Association for Environmental Education 1976).

The site(**Figure4.25 Figure 4.26**), which is on the Durham Johnson Upper school already exists, along with the pond so costs will be kept to a minimum, with most of the work (cleaning the pond, general tidying and cutting back the weeds and replanting) able to be done by volunteers. The site has been used as a wildlife study garden in the past by teachers but has now become overgrown (Bowen 1997).

The general conditions of the garden are :-

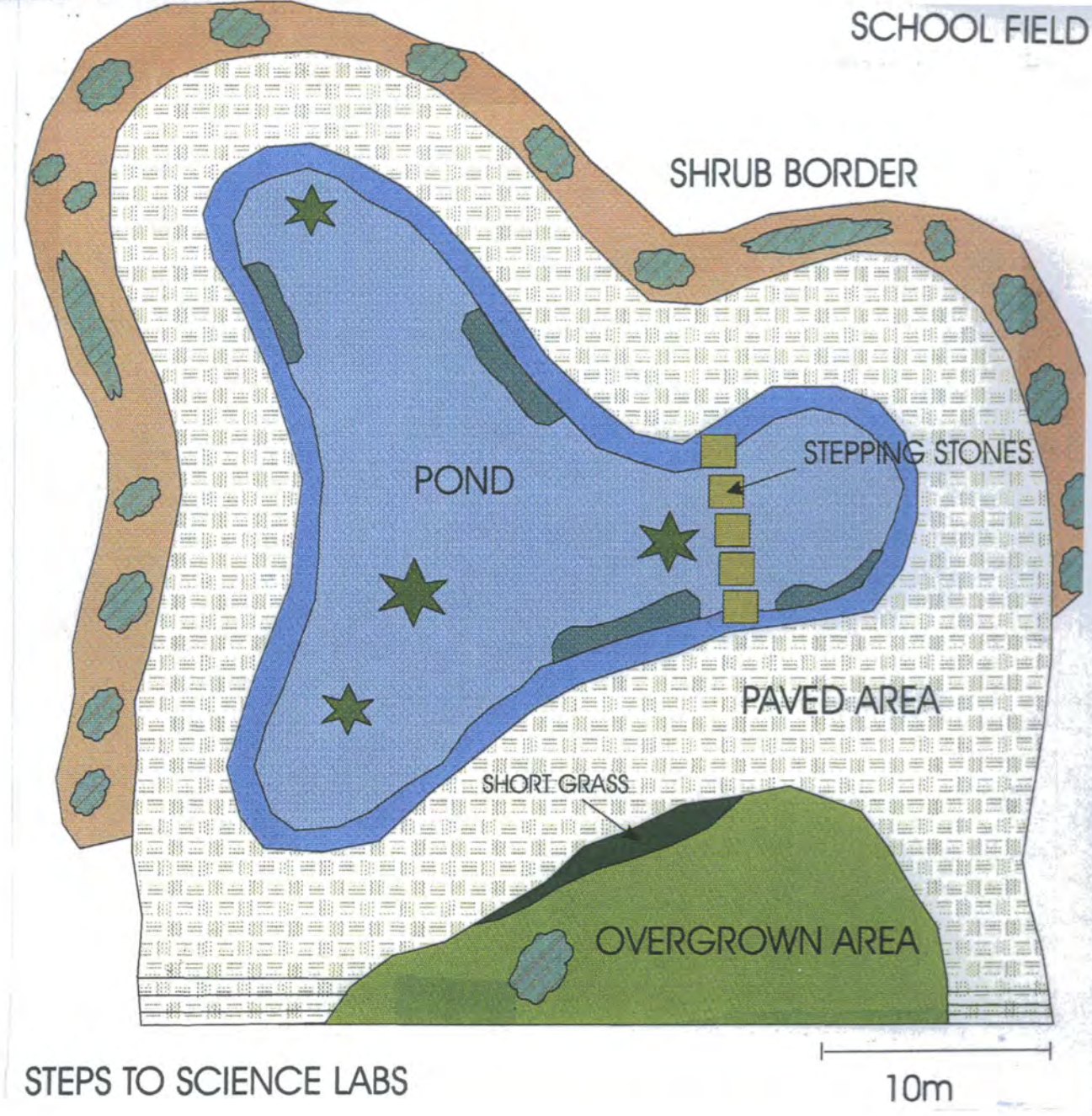
- A fairly well structured soil (pH 6.4).
- Some shade towards the north of the garden from the science laboratory.
- The site is in an 'alcove', so receives some shade and shelter from the climate.
- The pond is concrete lined but well established, so will not be toxic to wildlife to any great degree.

The process for the management plan is as follows:-

- Identify reasons for reviewing chosen landscaped area.
- Review the current situation.
- Find the best landscape model for the landscaped area.

- Identify suitable species for the site (taking into account prevailing conditions, temperature, topology and use).
- Draft plan.
- Manage and maintain landscaped area.
- Carry out repairs, maintain paths, pond liners, monitor plant growth and replace plants
- Weekly, monthly and a one year comprehensive inspection should be carried out in the first year to ensure that the site is functioning as it should.

Fig. 4.25 Durham Johnson Upper School (Grid Ref NZ 261428) Wildgarden and pond site



KEY

SHRUB

IRIS

MARGINAL VEGETATION

Suitable plant species for pond and wildgarden

Water Crowfoot *Ranunculus aquatilis*
Spearwort *Ranunculus lingua*
Canadian pondweed *Elodea canadensis*
Curled pondweed *Potamogeton crispus*
Buddleia *Buddleia davidii*
Creeping jenny *Lysimachia vulgaris*
Marsh marigold *Caltha palustris*
Common sedge *Carex nigra*
Common club rush *Scirpus lacustris*

Fig. 4.26 A computer generated 'Corel Draw' map of the pond and wildgarden at Durham Johnson School

An effectively maintained small garden project should:-

- Provide good quality resources to stimulate formal and informal learning;
- Ensure that the area is a safe and attractive environment;
- Ensure the healthy growth of the pond and it's inhabitants and shrub and grass areas;
- Encourage local wildlife and, hence biodiversity;
- Enable young people to understand and participate in caring for their environment;
- Take into account future plans for site and curriculum development;
- Allow for use by the wider community, where this is wanted;
- Provide a value for money service.

4.27.3 Suitable plant species for the site

Plant species suitable for wildflower garden, marsh and pond conditions have been recommended, and the species mix should attract wildlife, such as the Buddleia (Butterfly bush) and produce a constant range of colour and variety. The best time to plant is in April or early May, though with pot grown plants it can be done anytime. Using native species will produce the richest habitat and taking the plants habitat into account needs to be done, for example, semi emergent vegetation will need to be stood on a stone platform.Common native water plants suitable for small ponds **(Fig 4.27 and Fig 28)**:-

Deeper water plants	Shallows/ledge plants
Hornwort *Ceratophyllum demersum*	Spearwort *Ranunculus lingua*
Water crowfoot *Ranunculus aquatilis*	Mare's tail *Hippuris vulgaris*
Water starwort *Callitriche stagnalis*	Water forget-me-not *Myosotis scorpioides*
Water milfoil *Myriophyllum spicatum*	
Willow moss *Fontinalis antipyretica*	
Floating-leaved plants	**Marsh/edge plants**
Arrowhead *Sagittaria sagittifolia*	Water mint *Mentha aquatica*
Broad-leaved pondweed *Potamogeton natans*	Brooklime *Veronica beccabunga*
Yellow waterlily *Nuphar lutea*	Yellow flag *Iris pseudacorus*
White waterlily *Nymphaea alba*	Rushes *Juncus* spp
Water soldier *Strattiotes aloides*	Marsh marigold *Caltha palustris*
Floating sweet-grass *Glyceria fluitans*	Bogbean *Menyanthes trifoliata*

Fig. 4.27 Suitable plant species for different levels in a pond habitat

4.27.4 Invertebrates/vertebrates for the pond

Recommendations include using native plants as they will have to thrive in a fairly disturbed area of the school grounds, choosing species that are beneficial to the pond and provide colour, (for example, yellow flag iris). A small bank of logs could be incorporated to provide a habitat for, spiders, woodlice and other invertebrates. Butterflies, Red Admiral, Peacock, would be attracted by the food plants, (grasses, Honeysuckle and Buddleia).The pond already has a number of invertebrates, such as water beetles *Halliplus fulvus, Haliplus ruficollis*, common pond-skater *Gerris lacustris*, water-boatmen *Notonecta glauca*. There are no fish in the pond, but frogs have been seen and it is possible common newts *Triturus vulgaris* may be also be found there, (it is an offence under the Wildlife and Countryside Act,1981 to remove Newts and other animal and plant species, from other sites).

After planting the garden would not take to long to establish itself and could then be incorporated into field biology lessons.

Common Name	Latin Name
Common club rush	*Scirpus lacustris*
Water soldier	*Stratiotes aloides*
Arrowhead	*Sagittaria sagittifolia*
Common sedge	*Carex nigra*
Water Horsetail	*Equisetum fluviatile*
Stonewort	*Chara hispida*
Moss	*Drepanocladus aduncus*
Rigid Hornwort	*Ceratophyllum demersum*
Water buttercup	*Ranunculus penicillatus*
Common meadow rue	*Thalictrum flavum*
Milk parsley	*Peucedanum palustre*
Narrow-leaved marsh dandelion	*Taraxacum palustre*
Canadian pond weed	*Elodea canadensis*
Curled pondweed	*Potamogeton crispus*
Compact rush	*Juncus conglomeratus*
Soft rush	*Juncus effusus*
Common spotted orchid	*Dactylarhiza fuchsii*
Creeping jenny	*Lysimachia nummularia*
Marsh Foxtail	*Alopecurus geninculatus*
Foxglove	*Digitalis purpurea*
Buddleia	*Buddleia davidii*
Yellow loosestrife	*Lysimachia vulgaris*
Ladies mantle	*Alchemilla mollis*
Yellow flag	*Iris pseudacorus*
White water lily	*Nymphaea alba*
Yellow water Lily	*Nymphaea alba*
Marsh marigold	*Caltha palustris*
Water forget-me-not	*Myosotis secunda*
Purple loosestrife	*Lythrum salicaria*
Wood Anemone	*Anemone nemerosa*
Meadow sweet	*Filipendula ulmaria*
Marsh Saxifrage	*Saxifraga hirculus*
Marsh Cinquefoil	*Poteutilla palustris*
Primrose	*Primula vulgaris*
Honeysuckle	*Lonicera americana*
Daffodil	*Narcissus* spp.
Honesty	*Lunaria biennis*
Red Dead-nettle	*Lamium purpureum*

Fig. 4.28 Plant species for damper wetland wildgarden habitats (slightly acidic) soils

4.27.5 Recommendations

The following recommendations should be noted in the Maintainance and management of ponds:-

- Protect against ice -annually.
- Clean pond (varies according to local conditions) from weekly to six monthly.
- Repair pool 5-15 years (repair liner),concrete-check for cracks, (remove animals and plants to affect repairs).
- Clean pond (20-30m diameter).

A. Mechanically 6-10 hours every 7-10 years.

B. By hand 16-24 hours every 7-10 years.

- If evaporation occurs during dry weather, the pond can be topped up with rainwater.

4.27.6 Cost of plants and materials (**see Appendix 11**)

All these materials and seeds are available from:	NPK Landlife, 40 Farlands Drive, East Didbury, Manchester, M20 5GB Tel 0161 794 9314

4.28 Windmill Hill (Grid Ref NZ 270411)

4.28.1 Background

Windmill Hill is an elevated area to the south of Durham City. It is an attractive greenspace situated near St Aidans College, south of the city. From the top there are panoramic views of Durham City and Cathedral.

4.28.2 Current Management

Species currently planted include: Scots pine *Pinus sylvestris*, beech *Fagus sylvatica*, sycamore *Acer pseudoplatanus*. holly *Ilex aquifolium* and yew *Taxus baccata*. Tall ground flora consisting of hogweed *Heracleum spondylium*, dandelion *Taraxacum agg*. Bluebell *Hyacinthoides nonscripta*, common nettle *Urtica dioica*, daffodils, broad-leaved dock *Rumex obtusifolius*, (Woodward 1967). The hill originally had tall conifers growing on it but these were felled in 1989 as they were out of character in the Durham landscape. Along the main footpath, Rowan, cherry and maple are planted, along with yew and Corsican pine. Higher up the path leading to St. Aidan's College mature beech trees have been felled as their age has made them dangerous (a low fork, cracked and broke in a gale in September 1989) and are now underplanted with younger beech.

4.28.3 Future Management/ Recommendations

The site is in need of replanting, the bank is very dry and so establishment of vegetation has not been easy. Some more attractive native shrubs like *Viburnum opulus, Viburnum lantana*, dogrose and dogwood could be planted by the path. Spring bulbs should proliferate as many have been planted there in the past. Mature beech trees have been planted at the bottom of the hill and are thriving.

4.29 Wharton Park (Grid Ref NZ 269429)

4.29.1 Background

Wharton Park, was given by W. Lloyd Wharton to the people of Durham about 1850 and is situated towards the north west of Durham City on Western Hill. An obelisk

erected by W.Lloyd Wharton, marks the meridian, north of the University Observatory.Wharton Park is an important green space in Durham, like many city parks, Wharton Park is Victorian in origin with much of the characteristic elements of other Victorian city parks, such as a bandstand and plant Conservatory. Many of the older city parks originated as private gardens of the eighteenth and nineteenth century houses and still contain echoes of the design philosophy - the picturesque style of landscape gardening in which an enlarged correctly refined and idealised portrayal of nature was presented at an aesthetic level. The wildlife component of the scene was introduced by the construction of the aviaries, aquaria and sometimes a small zoological garden.

The social origin of the city park lay in the Victorian zeal for reform. Parks were seen as places for exercise to promote the health, comfort and moral well-being of the lower classes as a relief from squalid overcrowded housing conditions. Medical theory at the time postulated that diseases were the result of bad air which gave further impetus to providing the cities with lungs in the form of parks.By the end of the nineteenth century, parks were widely accepted as being an essential component of all cities. Facilities for sports were added as games became part of the school curriculum in the form of playing fields, tennis courts, boating lakes, bowling greens and small golf courses, (Wharton Park has tennis courts and a putting green).Civic pride was now a determinant of the character of parks and a high standard was achieved so that weeds, dead flower heads, even moss under benches were all but eliminated.Gradually the evolution of parks slowed right down; by the mid-twentieth century social conditions had changed beyond recognition with more leisure time, higher incomes, greater mobility and better education, however the parks had not changed greatly, their

role in society was now uncertain and they were becoming starved of finance. Today city parks are being run down in terms of resource allocation which is providing an opportunity to introduce new types of low-cost informal management which also have advantages for wildlife.This is likely to herald an era of park redesign. In Holland wildlife has been encouraged in city parks for several decades (Gilbert 1989).

4.29.2 Current Management

The park is managed by the Amenities and Leisure Division of the City Council. The landscape of the park is varied with large areas of mown grass. The Council's ground maintenance handbook recognises three different standards of grass, within the park, these are high standard, standard and occasionally mown. High standard grass is found round the entrance of the park, framing the herbaceous borders and along the main walks (**Figure 4.29**) it is a fine-leaved bent fescue turf, mown once a week during the growing season to a height of 8 mm and the clippings are boxed.
Once or twice a year it receives a dressing of fertiliser to maintain vigour and promote good colour. It is regularly aerated, scarified and also receives a spring application of selective herbicide.Over time annual meadow grass and Yorkshire fog have started to invade, (being one of the chief weed grasses which can stand close mowing down to 5mm). Standard grass is mainly rye-grass (*Lolium perenne*) it is sown as a mixture (including small *Poa* and *Festuca* species) to develop a two-layed community. This is done to increase wearing capacity and reduce opportunities for weeds to invade.The bulk of the park's grasslands are mown every two weeks during the growing season

using lawnmowers that do not collect clippings. Etesia PKTB lawn mowers are used for most of the general mowing in the park, this includes along park paths around herbaceous borders and around the childrens playing area Unmown grass areas, are on the steep slope borders of the park and around areas of tree planting, management, here is by strimming once or twice a year. Grass is left longer as it is harder to cut

Fig. 4.29 Wharton Park (Grid Ref NZ 269429) looking to the north, management includes mown grass areas near main walkways, (note tree 'whips' with supports along the perimeter)

evenly, costly and wastes time. Applications of growth retardant are a more cost-effective means of reducing the growth of grass where mowing is difficult, on slopes, banks and wherever conditions prevent or delay mowing.

Trees in the park make up small wooded areas and are mainly mature to over mature individuals, with some dating back to a few centuries.The main species in the park include, beech, ash, elm, hawthorne and sycamore with individuals of oak and holly.There are also formal beds of roses, annuals, herbaceous plants and rockeries.

4.29.3 Future Management

The Amenities Division of the City Council has a long term refurbishment programme for Wharton Park, involving upgrading the park infrastructure, improving landscape/horticultural features and general recreational facilities/visitor facilities. Replanting of many of the mature to over mature tree species in the park will have to be done soon.

4.29.4 Recommendations

- Mature to over mature trees in each of the park's 'sections'(**Figure 4.30** and **Figure 4.31**) need replacing soon.

  Replace with:-

  Common beech *Fagus sylvatica*

  Purple beech *Fagus purpurea*

  Oriental beech *Fagus orientalis*

- Remove all dead, dying and diseased branches that are overhanging North Road and path.
- Clean out most of the 'young' sycamores and natural ash regeneration as this invasion will in time start to dominate the beeches.
- The presence of desire lines indicates that many visitors to the park stray off

the paths on to the grassy slopes. This action combined with the soil characteristics and the steepness of some of the slopes is proving to be extremely eroding and damaging to the vegetative life in some parts of the park, (Whalley 1994). Desire line should be stopped, this can be achieved by the following methods:-

- Fence off the top part of the banks.
- Plant shrubs that are spiky (*Berberis spp*) around these areas.
- Place brush piles on these areas to deter the public from choosing these routes.

4.29.5 Summary

The park has a very good diverse mix of native evergreens and broadleaf trees. The age class is predominantly mature trees, with some over mature specimens which provides a highly attractive variation of heights, colours and shapes throughout the year, while providing an excellent environmental resource.

Due to the aesthetic and the ecological value of the park and it's high amount of public usage, it is important to have a regular (yearly) monitoring and possibly a more long term monitoring (95 yearly) scheme of the trees, taking into account suitable species type, age of the trees and adequate tree cover.

4.29.5.1 *Aims and Objectives*

- Notify authorities of current problems on the site and recommend actions in which they might be dealt with.
- To retain and enhance Wharton Park as a prominent landscape feature.
- To increase the aesthetic attributes, while also improving the ecological and

conservation values of the site.

- To increase and promote public involvement and use within Wharton Park.

4.29.5.2 *Ideal Objectives*

- To enhance the landscape character of the site.
- To increase the structural and species diversity of the site.
- To increase the aesthetic attributes, while also increasing the ecological and conservation values of the site.
- To increase and promote public usage.
- To educate and demonstrate urban woodland practices.
- Within reason, the involvement of the public within proposals and actions.

4.29.5.3 *Ideal management objectives Rationale.*

- *To enhance the landscape character of the site.*

This is to enhance the aesthetic value of the site, and to enhance the treescape of Wharton Park.

- *To increase the aesthetic attributes, while also increasing the ecological and conservation value of the site.*

This increase can be achieved by a planting regime and control of invading vegetation. This control of invading vegetation will allow more suitable ecologically rich vegetation to become more dominant.

- *To increase and promote public usage.*

This is aimed to be for the good of the park, and increase public Council relations.

- *To educate and demonstrate urban woodland practices.*

Section '1'
Composed of mostly mature to over mature beech.

Section '2'
Composed mostly of some sycamore, ash and elm. Apart from one cherry, oak and purple beech.

Section '3'
Composed mostly of beech *Fagus sylvatica*

Section '4'
Composed mostly of rosebeds (Rosa spp) and some beech *Fagus sylvatica.*

Section '5'
Composed of *Prunus* spp, *Buxus semervirens*, *Tillia* spp, *Rosa* spp.

Section '6'
Composed of *Prunus laurocerаous*, *Laburnum alpinum*, *Ilex aquifolium*, *Acer pseudoplatanus.*

Section '7'
Composed of *Prunus laurocerasus*, 'Marble White', *Acer pseudoplatanus*, *Ilex aquifolium, Populus nigra, Pinus sylvestris, Sambucus nigra.*

Section '8'
Composed of *Fagus sylvatica, llex aquifolium.*

Section '9'
Composed of *Laburnum alpinum, Acer spp, Prunus spp, Tillia spp.*

Section '10'
Composed of *Acer pseudoplatanus, Betula pendula, Ilex aquifolium, Fagus sylvatica.*

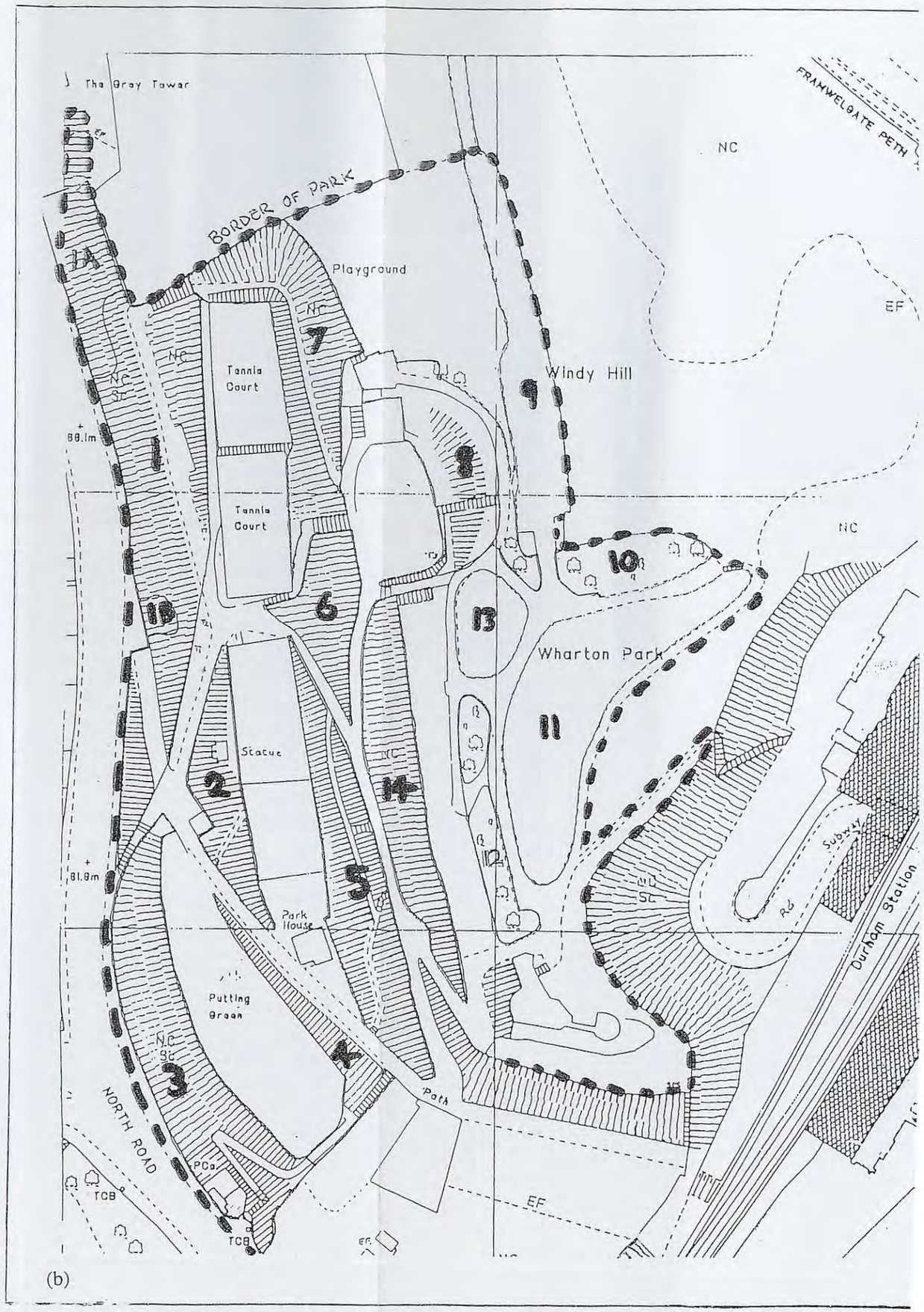
Section '11'
Composed of *Pinus sylvestris, Laburnum alpinum, Sorbus spp, Fagus sylvatica.*

Section'12'
Composed of *Fagus sylvatica, Ilex aquifolium.*
This compartment of the park, has a poor diversity of age class, mostly mature specimens, with some over mature specimens.

Section '13'
Composed mostly of coniferous trees, and beech.This compartment is generally in good order.

Section'14'
Composed of *Rhododendron spp, Prunus laurocerasus, Betula pendula, Laburnum.*

(a)



This would occur through, well informed and informal interpretation. Such as notice boards, signs, meetings and public involvement programs. This objective, combined with the others will assist in the residence and users of the park developing a greater awareness, appreciation and sense of responsibility for 'their' parks trees and environment. They become part of the decision making process that shapes their environment, therefore making an active contribution to its involvement.

- *Within reason, the involvement of the public within proposals and actions.*

This suggests ways in which the awareness and involvement of the public may be achieved. A community involvement program would be specifically designed to encourage the local residents to be involved with their publicly owned tree.

> *Community trees need to be managed with the community, and not just for them*
>
> (Hibbered 1989).

This is not simply in the interest of the local authority, although improved public relations, greater acceptability, reduced levels of vandalism and the availability of voluntary labour contributes to a more efficient and effective service. Importantly. Being involved is of benefit to the 'community' itself, for example, the residents and users of the park will develop a greater awareness, appreciation and sense of responsibility for 'their' park's trees and environment.

This community involvement could be implemented and monitored by a committee being formed.Below is a list of areas in which community involvement can greatly assist in the care of the park:-

- Sponsor-a-tree scheme and tree appeal.

- Community tree planting.
- After care of planting trees.

4.30 Gilesgate Green (Grid Ref NZ 286427)

4.30.1 Background

Green spaces created in cities can be relatively new, for example when old housing schemes have been demolished or where the decline of industry has left factory sites redundant. In contrast some of these areas may be as old as the settlement itself, these areas include 'greens'. Greens were originally used to serve the community and were used by livestock for grazing, communal services (such as the smithy water supply, by pump, spring or pond), recreation and meetings.

There is no clear evidence to suggest that they were ever part of a defensive structure, but they were defensible in times of need, greens were useful, even when they were not an integral part of the plan it is possible that a peripheral 'meeting of the ways' on the edge of the settlement provided a place to socialise.

In Durham city, Gilesgate Green (**Figure 4.32**) is one such example of this type of land use. The Green is located at the top of Gilesgate Hill and was originally separate from Gilesgate, the area is known locally as the 'Duckpond', although there is no duckpond there now, a report from 1850, as part of the City's Charter advised that it should be filled in because of the smell, this was duly done in the later part of that year (M . Johnson 1993).The area is used by local people as a place to sit down and talk to friends or passers by.

4.30.2 Current Management

The green is still an important 'meeting place' in the city. It is managed by Durham

City Council. The current management regime involves grass cutting 20 times per year to a height of 6cm, strimming around trees to remove long grass and weeds is also carried out. The Amenities Department is familiar with the tree damage condition 'strimmer blight', caused by strimming carelessly too close to the trees and try to make their staff aware of the problem.

Since the management of the green is not too complex it may be desirable to devolve the control to the local community or to the residents around the green. Although this may not be appropriate in all situations, its potential benefits include an increased sense of commitment by people to their local area, reduced costs and liabilities to the local council.

Fig. 4.32 Gilesgate Green, (Grid Ref NZ 286427) an example of historical greenspace in Durham

The green has a healthy grass sward, related to the substrate, which is of a good intermediate structured soil with an acidic pH of 6.3.

A path runs through the middle of the green and a waste bin and three wooden benches are situated alongside the path, there are also two flower borders on either side of the path, these have been planted with daffodils, small rosebushes and tulips. The green's eight trees, (sycamore and beech) are situated away from the path and so decaying leaves on the path are not a problem. The trees require minimal management now that they are mature specimens, except for the occasional branch that may need to be lopped, if it presents a danger to traffic on Gilesgate road.

4.30.3 Future Management

The City Council have no plans to change the management of the green in the near future. As the current regime is deemed adequate. A further improvement though could be to incorporate a hardy native wild flower border or bed, to add extra colour during the spring and summer months.

At the corner of the Green, several new houses are being built, but will not cause any damage to the Green itself.

4.31 Palace Green (Grid Ref NZ 275423)

4.31.1 Background

The Cathedral forms a backdrop to a famously known green in Durham City. Situated to the northern end of the cathedral, Palace Green separates the Castle from the Cathedral (**Figure 4.33**).

Until the twelfth century, during the time of Bishop Flambard this area was the centre of Durham and the site of the old market place. It contained a mass of wooden houses huddled together, most were removed as they created a potential fire risk which threatened the Castle and Cathedral but some survived up until the eighteenth century (Roberts 1994).

Fig. 4.33 Palace Green (Grid Ref NZ 275423), an important and historical greenspace in Durham (1997)

4.31.2 Current Management

The management of Palace Green has not changed since it became an 'open area' after the houses were cleared.The Green, is a grassed area and fulfils a functional role as a foreground centre piece for the Cathedral and the surrounding buildings. Originally it was envisaged as the University's quadrangle, it's function now is to act as a site for various events which are staged on it, (e.g. the 'Environment Day' fair in May 1996). To these ends, management consists of keeping the grass short, to a height of 3cm and cutting regularly during spring and summer. The area has a strict management regime to keep up its appearance, as it is seen by many tourists which visit Durham

each year. Also in order to keep the grass in good condition, 'Keep off the grass', signs have been erected by the Council.

4.31.3 Future Management

There are no plans to change the management regime of Palace Green as it has a strict functional use as a show centre piece for the quadrangle of buildings, therefore anything other than a grass surface would detract from this view.

4.32 Elvet Sands (Grid Ref NZ 276431)

4.32.1 Background

Elvet Sands (**Fig 4.34**) is a large area of common green space land near the River Wear in Durham. It is used mainly as an amenity area for a range of recreational activities (football and other sports and by families). Crook Hall, (a private house and walled garden dating to the 12th century, occasionally open to visitors by appointment) overlooks the river, where a ferry used to cross to the sands.

Elvet Sands is under the landuse catergory of common land in Britain, there are still some limited but valuable areas of *common land* , in which specified commoners are permitted to exercise certain rights (for instance of pasturage), and *de facto* public access rights typically exist; collective decisions are normally taken by a committee representing the various users.

4.32.2 Current Management

There is little management information on Elvet or Durham Sands (as it is known locally) the Sands is used as a common amenity area for the people of Durham, and also for easter fairs and summer events. It was originally the property of the Freemen of Durham for their use as cow pastures (M . Johnson 1992).

Vegetation on the site consists of a combination of rye/wild grass, clover/ wildflower mix, with the prominent species being daisies *Bellis perennis* and Buttercups

Fig. 4.34 Elvet Sands (Grid Ref NZ 276431), a greenspace in Durham City with it's origins as a public common

Ranunculus acris. The Sands is managed by the City Council as a low maintenance site, which suits the area as its proximity to the river encourages wildlife.The most

management it receives are frequent grass cuttings, to a height of 10cm during summer. The edges and banks are left alone and several species of wildflowers, primrose *Primula vulgaris*, Foxglove *Digitalis purpurea*, Ox-Eye Daisy *Chrysanthemum leuchanthemum* and Wood Crowfoot *Ranunculus auricomus* have gained a hold there.

4.32.3 Future Management

There are no plans by the City Council to manage or develop The Sands as anything other than a public common on which to stage fairs and to provide an amenity for tourists and local people. This is partly due to the proximity of the river, as the area is liable to flooding. This low level management is also beneficial to local wildlife.

4.33 Pity Me Carrs (Grid Ref NZ 270440)

4.33.1 Background

The Carrs Nature reserve comprises 8.215 hectares, situated at Pity Me, on low lying land mid-way between the villages of Pity Me and Framwellgate Moor, north of Durham City. The Carrs gets its name from a series of peat flats (carrs) which mark the sites of former lakes.

The site is bounded to the north-west, north and east by a corridor of County Council owned land whose long-term land use is not yet determined. Outside, the land is owned by the Environment Agency, eastwards is the County Council central repair workshops, while a private housing development borders the west of the site. The Framwellgate Moor Comprehensive School lies to the south separated by a County Council owned former mineral railway embankment which now supports a public footpath. Access to the site is along the former mineral line. There is direct pedestrian access onto the site from Bishop's Close to the west end from the north via a wicket

gate.

The County Council owns the freehold of the site, this having been purchased in 1951 along with High Carr House which was acquired and held for development purposes. Adjacent to the south-east corner is land subject to stable tenancy in favour

Fig. 4.35 Pity Me Carrs (Grid Ref NZ 270440), clearance of bracken by burning (gorse in the background)

of Mr R.W. Grahame who has also been permitted to keep horses on the site, subject to the conditions of grazing licences on the Carrs. Claims have also been entered for the registration of four footpaths over the Carrs. The area is a Site of Particular Ecological Interest (S.P.E.I.) but is not a Site of Special Scientific Interest (S.S.S.I.).

It has been appropriated under section 21 of the National Parks and Access to the Countryside Act 1949, as a nature reserve.The site gently undulates, dipping towards the west against which margin the land is marshy and contains two ponds, which dry out most summers. In the centre of the site and towards the west, the ground flora comprises mainly moorland grasses bracken, gorse and heather (**Figure 4.35**) but there is also adder's tongue fern and northern marsh orchid.

There is a varied insect population, vertebrates include the Great Crested Newt, whose habitat is protected by law, trees along the embankment to the south attract many birds such as Willow Warbler.

The site is spanned by two overhead power lines, there is a sewer along the western boundary but there are no records of any other services runs.

4.33.2 Current Management

A problem with Rosebay Willowherb, gorse and bracken exists and these species can choke the other plants out. For example the area to the south of the site was heather (Erica spp) dominated two years ago, it is now largely occupied by bracken. The heather also suffers from being burnt by local teenagers who use the site to ride motorbikes.A small number of horses have been allowed onto the site and have partially controlled the spread of bracken by trampling it.

There is little or no management on the site and the Carrs Management Committee, formed when the houses bordering the site were being built has fallen by the wayside. There was some attempt to hide the houses with small scale tree planting but little else has been done since then, although the British Trust for Conservation Volunteers (BTCV) have been interested in management of the site as has Paul Lupton, who surveyed the site in 1989 (**see Appendix 12 for notes and species list**) and is one of

the original members of the Carrs Management Committee. Now however, the site does look as though it will receive management as the Carrs Management Committee are being reformed and are working inconjunction with Dr Chris Spray -Northumbria Water and the Environment Agency who have recently, (November,1997) started drawing up plans for the site.

4.33.3 Future Management

The site is subject to a licence agreement in favour of the Framwellgate Moor Parish Council with the County Council as licenser.The site is not a public open space, but footpaths have been claimed and are registered, public access is permitted on them, but access elsewhere should be regulated. According to ecological priorities footpaths should be maintained in a safe and functional condition while preserving their natural character as far as possible. Problems and complaints have occurred from use of the area by teenage motorcyclists and from fly tipping, these and other undesirable activities must be controlled to prevent nuisance or damage.

Recently the Environment Agency are looking in to ways to restore the site and making the ponds permanent.

4.33.4 Recommendations

- The removal of Rosebay Willowherb, some gorse and bracken and control of some of the more evasive weeds on the site.
- The two ponds on the site need to be dug out more substantially so they will remain throughout the summer.
- A professional hydrology study of the water table of the site should be carried out to access the extent of drainage in relation to the ponds.
- Surfacing of some of the footpaths could be carried out to encourage public usage and thereby show that it is being cared for, this may keep the

amount of misuse (fly tipping and motorcycles) down on the site.

- Encourage the use of information vandal proof posts/plaques to educate people about the wildlife of the site.

4.34 Mount Oswalds golf course (Grid Ref NZ 266406)

4.34.1 Background

There are currently 1700 golf courses in England. Most of these course are inland and have varying amounts of heath, scrub and woodland. Forty of these courses are triple S.I's, some are home to Great Crested newts and one is home to Natterjack toads. Only 2% of these courses have any form of a woodland management plan (Nicholson 1985).

Mount Oswalds golf course located, in Durham is situated in the grounds of the Georgian Mount Oswald manor house, it is a parkland course (**Figure 4.36**) and also contains woodland, a mixture of beech, oak, ash and pine.There is archaeological interest attached to the site, as the course is located on medieval ridge and furrow field patterns.

4.34.2 Current Management

Current management regime of management is co-ordinated by head groundskeeper, Richard Hood. Specific grounds maintenance tasks have to be carried out during each season so that the course is always up to a required standard and can always be used by it's members.

Fig. 4.36 Mount Oswalds golf course (Grid Ref NZ 266406) with large deciduous tree belt in the background

The maintenance of the course was priced at £30,000 in 1997(machinery cost was not taken into account in this figure).

Management of the course is dependent on the growing season, which usually lasts from April to mid November in lowland Durham. During winter (December, January and February) the course is in limited use and the groundkeepers are involved in reconditioning work, this involves, landscaping, renovation of buildings, such as the club house and repair of the teeing off areas and reconditioning of the bunkers also, during winter the trees are pruned back and any tree surgery is carried out.

In spring, when the growing season begins the grass is treated with a herbicide agent, usually Glyophosphate to eliminate competitive weeds, one application treatment on the course costs £500-£1000, a total of £2,500 was spent on herbicides in 1997.

During this time the grass is monitored daily to ensure good growth.

During Summer, when the golf course is at it's busiest, the majority of the ground keepers work is mowing the course, gang mowers are used for the majority of the course, the grass used is a rye grass mix to provide strength and durability of the sward. Grass on the Fairways is cut once a week using gang mowers set to the height of 15-20mm and Etessia PKTB mowers that retain cuttings and are set to a height of 5-10mm for the greens. An important job is emptying the bins around the course, this is done twice weekly during the summer and one day per week, a junior greenkeeper picks litter off the course.

In the autumn months, one of the busiest times for the ground keepers, grass seed is sown mid to late November using a mechanical seeder, seeding is a very necessary part of the maintenance on the golf course as a significant amount of damage is done to the fairways and the greens by compaction. During the autumn months aerating of the ground, using a mechanical spiker is also carried out. Another main task at this time of year is leaf clearance.

Certain areas on the golf course are allowed to grow of their own accord, specifically, the 'rough' and the hedgerows along the boundaries of the course.

4.34.3 Future Management

Conservation and tree management are two very new approaches which are being integrated into golf courses. Although golf architect, (H.S Colt,1869-1951) who designed many courses in England as well as Europe and America was the first to prepare tree-planting plans for his layouts. Colt was still very reserved about the use of trees within the strategy of a golf course (Cornish 1982)

Trees are a fluky and obnoxious form of hazard, but they afford rather good protection, and if a clump of these exists at such a spot it might well be considered justifiable to leave it standing

(H.S.Colt, Some Essays on Golf Course Architecture, 1920).

Trees can be used not only to improve the aesthetics of a golf course but also as an integral part of its strategy. Trees are at risk on golf courses by damage usually from golf balls. A golf ball can travel at up to 70 or 80 metres per second. Anything that is material which comes within the line of play is therefore likely to suffer severe damage. Because of the large numbers of rounds of golf that are played annually on most courses (typically several tens of thousands) then by shear chance alone contact with trees on the golf course is inevitable. Golf balls can affect both young and old trees alike, causing damage to the bark, cambium, phloem and xylem layers which is often so severe that the tree is permanently disfigured and crown die-back may occur as a result of damage to the trees transportation system.Young trees can suffer by being snapped at the point where they emerge from the protection of the shelter, the shelters themselves may be damaged and if not replaced quickly the sharp edges of the shelter (as a result of impact damage), can often inflict fatal abrasions to young trees. Trees on certain parts of the golf course are more likely to suffer damage by golf balls than trees in other areas, there are two contributory factors to this. Firstly because the majority of golfers slice the ball, trees on the right hand side of a hole are always at greater risk. Secondly trees which are positioned at 165 metres to 210 metres from the teeing ground are endangered, because they are more likely to suffer the effects of a ball travelling at near maximum velocity, therefore trees planted at such a distance on the right hand-side of the fairway are most certainly at risk. If new planting is to be carried out damage to trees can be reduced by avoiding these areas, damage to trees can further be avoided by correct species choice and by appropriate protection.Thin

barked species such as sycamore and beech are more vulnerable than the thicker or spongy barked species such as oak, ash or pine, the exception being lime, although thin skinned its unique cell structure means that the damage incurred is not as critical as to most other species. However all trees do suffer damage to some extent, the wound openings allow entry to fungal predators and the resulting stress further predisposes the tree to secondary pathogens.

Protection to new planting may be afforded in two ways, firstly physical protection by the use of guards and secondary protection through the rules of golf. It is natural for golf clubs to have a reluctance to implement rules giving free drops from newly planted copses, as it disrupts play and is never popular with members.

If the course is on ancient woodland or on a Site of Special Scientific Interest, S.S.S.I., provision may have to be made for these areas on the course, such as notifying members, fencing off certain points, otherwise areas where there is sensitive woodland or unique habitat may be disturbed from golfers playing too near to these places. In this case signs should be put up establishing these areas as sensitive sites. Also if possible a full baseline study must be carried out in order to discover the importance of the site and confirm species lists. If trees are to be planted in these areas, then the species selected must blend in with other species, reflect the surroundings and be compatible with soil type, pH and climate of the area. Tree planting is a long term stratergy and therefore the implementation of a rule for the

relatively short period of 5 or 10 years would seem inconsequential. However the pressure committees are put under by members whose only interest is that their game is not disrupted is immense, this short term mentality is however detrimental to the long term management of the golf course. Most tree-planting programmes will be restricted to the margins. A course with every hole completely isolated from the others is ideal, unfortunately this is not usually possible in many inland courses, (including Mount Oswalds) where they are usually laid out on closely parallel lines for maximum length and economy of land use.

4.34.5 Tree management on golf courses

When siting trees on golf courses the following recommendations should be adhered to:-

- Unity - This factor should relate not only to the types planted, but their relation to the form of the site. Tree planting should move with the contours and horizons. Planting is better in groups not lines; clumps not avenues.
- Graduation - Link major tree groups to open space with diminishing groups and specimens. Soften hard edges with lower growing trees or shrubs. Let salients and re-entrants break any suggestion of a sharp outline along fairways. Plan glades to lighten dark areas.
- Contrast - Opposition of form and colour can create striking effects.
- Contrast trees with an open head against those with denser foliage.
- Harmony - On wooded sites, respect established patterns and types.
- Compatible planting, however need not follow surrounding species, i.e. a golf course is big enough to be treated as a landscape unit in it's own right.

- Vary natural profile of trees, to create staggered planting.

Tree planting on golf courses in the UK is being pioneered by Eamonn Wall and Co, Environmental Consultants, and particularly John Nicholson, a specialist in tree management on golf courses. Recommendations from Eamonn Wall Environmental Consultants for planting trees on golf courses:-

Management Practice	Advice
• Protect tree roots	- Roots usually spread out for a distance, equivalent to at least the trees height. Avoid drains, ditches compaction and storing or stripping soil in area.
• Select tree species for ball resistance	- Thin barked species such as beech, cherry and Rowan can be killed by ball damage, resistant species include oak, ash, pine and lime.
• Remove stakes	- Stakes and ties can kill trees. Make sure they are a good fit. Remove them if they are no longer needed.
• Avoid grass cutting near to trees	- Machines damage trees and cutting grass near to them makes them grow slower.
• Weeding	- Weeding a one metre diameter spot around a tree will double its growth rate.
• Don't strim	- Strimming kills trees, through the condition known as strimmer blight.Weed instead.

- Position trees Carefully. - Avoid future problems by keeping large trees back from tees and greens.
- Protect trees - Protect trees from rabbits, hares, voles, deer, golfers and strimmers.
- Keep out of young tree areas - Avoid ball and club damage to young trees by implementing a lift And drop rule.
- Tree species - Plant trees which are compatible with the landscape native are best for creating an all-year round effect.

A five year survey plan of the trees on the course is being carried out by Houghall College. The plan is to look at the trees already there, their age and history and to suggest if they need to be replaced or others added. The report should be available in 2001.The head green keeper is in regular consultation with Houghall College and can question the planting scheme guidelines. Native species are encouraged to be used when replacing or replanting.

4.34.6 Summary

Future management of the course, in keeping with the sympathetic conservation line. Would be to continue planting native trees, which suit the parkland course. Mount Oswalds is increasingly starting to use conservation management techniques on the course, this is partly due to the head green keeper, who is concerned about the natural look or genius loci. He has encouraged native planting and is involved in the five year tree planting survey. (Mr Hood belongs to the Green Keepers Union, who are now taking the view that conservation of the environment is becoming more necessary in the management of golf courses).

4.34.7 Recommendations

Planting Trees - a guide:

When planting trees on a course the following pointers are recommended:-

- How big? - Woods 15 metre minimum width, 0.10ha minimum area for for grant aid. Trees no bigger than 60/90cm unless for effect.
- Where? - Avoid frequent landing zones and avoid planting on the fairway.
- Species? - Golf ball tolerant, compatible with landscape. Species requiring maintenance after establishment.
- When? - Planting season is November to March.Grant aid approval takes 12 weeks.
- Spacing? - As close as can be afforded -2 metres is best. Wider spacing in tubes to defray cost. Vary overall spacing to create natural effect. Do not cut grass between trees - it takes too long and will damage them.
- Maintenance? - More trees die from lack of weed control than any other factor. Allow for five years of weeding/after-care.

Managing Trees:

The following recommendations should be observed when managing trees on golf courses:-

- How often? - Constantly- particularly mature trees near inplay areas. Allow for an annual budget.
- When? - Winter months are best for pruning/tree surgery and coincide

with the quietest period on the golf course.

- Advice? - Never attempt to fell trees without proper training. Ensure contractor is fully insured.

To date Eamonn Wall and Co. have been successful in securing grant aid for over 50 clubs from Aberdeen to London.Net costs vary from £1000 to £9000 (**Figure 4.37**). (source Eamonn Wall and Co.Environmental Consultants).

Case studies 1997/98 costs

1. Balbirnie Park - Fife
   Grant of £2,590 for managing 14 ha of small woods over 5 years.

2. Roseberry Grange, Co.Durham
   19,000 trees planted, 72% grant

3. Brookdale, Manchester
   6,000 trees planted, 47% grant

4. Hadley Wood, London
   grant of £4,125 for managing 23 ha of woodland over 5 years

Fig. 4.37 Case studies of different golf courses and woodland grants (Source Eamonn Wall and Co. Environmental Consultants).

4.35 University of Durham Estates and Buildings Department

(Grid Ref NZ 276415 - science site)

The Estates Department (part of the Estates and Buildings department) at the University of Durham, manages the green areas around all the departmental buildings, Science Site and colleges and in addition 40.47 hectares of woodland which includes Maiden Castle Wood, Hollingside Wood, Great and Little High Wood and Houghall

Wood. The University also owns areas on the River Banks, behind St. Giles Church at Gilesgate, by Elvet Hill Road, Potters Bank and Shincliffe Hall.

The University estates in Durham comprises some 212 hectares of this land:-

- 61 ha is operational, i.e. used for the University's core activities;
- 19 ha is playing fields;
- 73 ha is tenanted agricultural land and 9 ha is leased out for other uses.

The Estates and Buildings Department's mission is:-

> *To provide, maintain and develop a safe and high quality environment, in a professional, efficient and cost-effective manner.*
>
> (Estates & Buildings Report,1996).

4.35.1 Examples of University landuse

- Van Mildert College (Grid Ref NZ 269409) - Recognised by its lake (range of habitats, fringe/sedge zone) is set in parkland 1.6 km from the city centre (**Figure 4.38**).
- St Aidan's College (Grid Ref NZ 268412) - The college is 1.6 km south of the city. St Aidans gardens is open to the public and a guidebook is available.
- Trevelyan College (Grid Ref NZ 272412) - Set in parkland within 1.6 km of the city centre. The site gained a Civic Trust Award in 1969 for its outstanding contribution to the surrounding scene.

Fig. 4.38 Lakeside at Van Mildert College, showing sedge and reed bed

4.35.2 Estates and Buildings Department and grounds maintenance contracts

Durham University is a collegiate University, this means it is made up of different colleges. Individual colleges are allocated finances for running costs and also grounds maintenance.

There are two options available for grounds maintenance:-

- The colleges can contract the Estates and Buildings Department to carry out grounds maintenance or choose to use an outside contractor.

The Estates and Buildings Department, offer grounds maintenance contracts to each college tailored to it's own needs, priorities and resources with costs as part of the service. In 1997 all but one college placed it's contract with the Estates and Buildings Department (Estates and Buildings Report,1997).

4.35.3 Benchmarking exercises and increasing the efficiency of the Estates Department

For many years the University, through Estates and Buildings, has been proactive in developing plans for maintenance of its premises. In 1990 the University anticipated the Funding Council's requirements by initiating its own condition survey, from which a Maintenance Strategy was produced and published in 1991. A further revision was also published in July 1993, and was appropriated to include the grounds as well. Grounds maintenance has been the subject of an extensive benchmarking exercise following a recent audit report in the Estates and Buildings Department.

Benchmarking is a process of systematically comparing the performance, costs and procurement methods in different organisations, to identify best practises.The scheme was implemented in June 1997.

The aims of the benchmarking exercise include:-

- Reducing costs;
- Achieving more with fewer resources;
- Identifying alternative procurement methods;
- Improving quality of service;
- Assisting in changing culture and staff behaviour;
- Identifying process which will achieve the greatest improvement; and
- Setting targets for improvement.

The benchmarking exercise is being driven by John Housley and a small team of representatives from the Treasury, Personnel and the Colleges connected with the management of grounds maintenance within the University. The process has required a great deal of input and provision of detailed information both from organisations and from customers; while other organisations have been keen to take part, the reluctance

of many customers to translate anecdotal evidence into quantifiable fact has been a source of some disappointment for the scheme.The whole process consists of the following stages:-

- Identification and recruitment of partners;
- Agreeing data to be collected;
- Recording steps in the process under consideration, and procurement; methods;
- Comparing these processes and procurement methods;
- Collecting data;
- Analysis of data;
- Reporting on results; and identifying action required in light of Results. (University of Durham, Maintainance Strategy,1997/98).

4.35.4 The Maintenance Strategy

The key objectives of the Maintenance Strategy are:-

- To have a clear schedule of the work required to the built estate and estate grounds over the next ten years;
- To identify the costs of carrying out this work, so that funding can be applied accordingly;
- To identify assets (buildings and grounds) that require replacing, because of age or condition, rather than uneconomically maintaining them;
- By planning work, to ensure that scarce resources are used effectively and value for money is secured;
- Ensure that the estate is maintained in good condition and that its condition

does not decline (psychologically, students have been found to work better in nicer surroundings);

- Therefore make a positive contribution to the University's core activities.

Planning for maintenance enables targeted action to be taken in a timely and cost-effective manner : this, in turn, helps to ensure that the University's asset portfolio can remain appropriate and productive for the lowest possible long-term costs. Planning maintenance will therefore increase value for money.

4.35.5 Services carried out by the Estates Department

4.35.6 Grassed areas

Management of the grassed areas around the departmental buildings involves mowing 18 to 20 times per year with either a ride on tractor or rotary mower. Specific areas are cut with a hand machine where it is impractical to use machine mowers. Some areas (such as in courtyards), require the cuttings to be boxed off. In general, the more of a sward which can be cut by tractor-mounted equipment, the cheaper it will be to maintain. If a tractor can easily be operated without having to back into corners, turn tight corners and avoid obstacles, the mowing task will be quicker and more efficient. In addition the less grass which is missed by the tractor and needs to be cut by smaller, slower equipment, the more efficient will be the layout. 'Design for tractor mowing' need not result in a dull landscape, but it requires a good knowledge and understanding of the operating characteristics of the machinery to be used, in particular turning circles, widths, versatility, etc.

The perimeters of the grassed areas are treated twice a year with an application of herbicide to kill weeds, selected areas around beds are weedtreated once during the growing season. Long grass areas are strimmed 3-4 times per year, grass around

lamposts or trees are treated with herbicide thus reducing the need for strimming. Also boundaries with fences, hedges and buildings are similarly treated and are included within the grass cutting rates.

4.35.7 Shrub/flower beds

Shrub/flower beds are maintained six times a year with general maintenance being carried out, i.e.hand weeding and forking over. Shrub beds are treated with two applications of herbicide per year and pruning of bushes (including) roses is done as and when required and is charged on a time and materials basis. Provision of bedding plants is also done on a time and materials available basis. Roses are fed once a year.

4.35.8 Hedges and fences

Maintenance work on hedges and fences is done on a time and materials basis depending on the priority of the job in question.The grass which is under or is adjacent to hedges or fences is treated with either an application of herbicide or is trimmed back if the weeds are in a small area. Hedges are cut once a year.

4.35.19 Tree maintenance

Tree maintenance is not included in maintenance costs and is priced separately according to the type of work carried out. Inspections are carried out at the discretion of the Horticultural Officer, or following a request that work should be carried out on a particular tree.Tree surgery or removal is charged on a time and materials basis as are inspections, reports and obtaining the required permissions -such as when carrying out work on trees with preservation orders attached to them.

4.35.10 Time and materials cost

The Estates Department divides work between operations that are part of a regular maintenance programme, such as grass/hedge cutting and work which does not form

part of a regular maintenance programme.These are operations which are labour intensive or are carried out on an infrequent basis and if this is required to be done, then colleges are charged on a time and material basis for the work undertaken or materials supplied.

Some typical operations which fall into this category are as follows:-

- Tree Maintenance - Inspections, Pruning, Removal.
- Planting - Bedding plants, removal of same, replacement of shrubs providing tubs of flowers or arrangements for special functions Repairs/reinstatement following damage by third parties.

The Horticultural Officer is responsible for all the grounds maintenance to the University property and if work needs to be carried out then that decision is final. Work is prioritised and stored on computer database. No work is to be subcontracted to a third party without the Horticultural Officer's consent.The cost of the work is charged on completion at the following rates (subject to change, no figures available):-

Horticultural Officer	£	/hour
Working Supervision	£	/hour
Labour	£	/hour

4.35.11 Future Management of the Estates Department

The Estates and Buildings Department will continue to operate as a streamlined and efficient part of the University. It is also committed to constantly reviewing management practices, such as benchmarking for grounds maintenance and continually upgrading its operations. For example, as part of the review of the

woodland management plan, the Estates Department surveyed 100 interested parties to establish what they identified as priorities: responses included, protection of deer, badgers and red squirrels, more diversity of species, maintaining a quiet and peaceful area for recreation, making more use of woodlands for teaching and research, improved information and signing and banning mountain bikes. As part of this exercise, a detailed survey was also carried out of red squirrels in Hollingside Wood, identifying ways of protecting them and their habitat from encroachment by grey squirrels.

4.36 University Woodland

The University owns about 40.47 hectares of woodland, including, Maiden Castle Wood, Great High Wood, Little High Wood, Hollingside Wood, Pinnock Hill and Blaids Wood. In addition the University owns areas on the river banks, behind St Giles church at Gilesgate, by Elvet Hill Road and Potters Bank and Shincliffe Hall. There are many general points which affect the management of the woods which should be considered before starting a detailed study of each wood.The woods have been managed in the past to provide a variety of functions, future management should take in to account their present relevance to the University and the city.

4.36.1 The Management of University Woodland

This Five year plan is based on a review of the original plan, which began five years ago, (1993). Much of the information is still relevant five years on, with many of the priorities originally suggested (For example protection of deer, badgers and red squirrels, more diversity of species, maintaining a quiet and peaceful area for recreation and making more use of the woodlands for teaching and research).

The Management Review Plan has been broken down into eight sections and also specific locations, where land is managed by the University.

4.36.2 The Law

There is no doubt that the woods contribute greatly to the beauty of Durham City and they should be preserved for their great natural and amenity value, but the University has a legal responsibility for their upkeep and must maintain certain standards of safety within the woods. In practice this means that particular attention should be paid to trees near roads, footpaths and buildings. If after inspection a tree is considered dangerous it must be felled as a matter of urgency, failure to fell or lop a tree which has been pronounced unsafe by either an outside expert or the Horticultural Officer could make the University liable in the event of someone being hurt by that tree and a case of negligence could be brought against the University.

The University also has a responsibility for trees on it's land which abuts neighbouring properties, the trees must not cause a nuisance to neighbours by their branches or their roots. In these cases good aboricultural practice can be insured if the University undertakes the necessary lopping and pruning involved, likewise the University must not let its trees interfere with electricity and telephone lines and must comply with requests from Northern Electric or telephone companies to lop trees threatening their lines.

4.36.3 The Planning Authority

Felling licences should be obtained if more than 2 cubic metres of timber is to be felled in one quarter year (this does not apply to trees in gardens or those which are dead, dying or dangerous), if new buildings are scheduled for a site, they will come under permission and no felling licence is needed for them, (obtained from the

Forestry Commission). The city planning authority should be informed before any tree work is carried out on trees within the city conservation area (The Bailey, The Riverbanks, Hild and Bede College, Elvet, The Racecourse, Maiden Castle and Green Lane).The planning department will need 6 weeks written notice before permission may be given. Only if a tree is dead, dying or dangerous can it be felled without permission and to avoid difficulties the city planners should know about it in any case. Outside the conservation area it would be problematic for the main bulk of the woodland if Tree Preservation Orders were to cause yet another barrier to proper woodland management. Previous good relations with the city planners which have been built up over many years should continue -this means that the planners should be informed either in writing or verbally of any tree work in the woods especially if it is near roads or is visible from the Cathedral.

4.36.4 Research and Teaching

In 1988 a memo was sent to the academic departments considered to have possible teaching or research interests in the University woodland asking them to detail areas which they used.The Department of Biological Sciences reported that Hollingside Wood and Blaids Wood were used extensively with Little High Wood and Great High Wood used occasionally. The School of Engineering and Applied Science expressed concern about carrying out important research near Blaids Wood using Hollingside lane for access. Tree work therefore in Blaids Wood, Hollinside Wood and Little High Wood, including felling and extraction should be carried out only after consultation with these departments, to minimise the threat to research projects, the Department of Biological Sciences too should inform the Horticultural Officer if their work extends to other sites or if the work would be jeopardised by normal Woodland Management,

i.e,.thinning, felling of over mature trees, cleaning ditches etc. One person should be nominated from each Academic Department concerned, to act as a contact with the Horticultural Officer.

Working with different departments helping them achieve objectives of research and teaching should be of utmost importance in a University Woodland Management Scheme, however it remains the responsibility of the Horticultural Officer to control the manpower land and resources needed to implement sensible management procedures.

4.36.5 Conservation and Amenity

Generally, management to conserve the flora and wildlife in the woods is in line with amenity management. Variety in tree species and their ages and a good cover of undergrowth is considered better for both conservation and amenity, this can be achieved by a sound policy of selective felling when trees are overcrowded, dangerous, or of a less favoured species like sycamore and beech. Natural regeneration is very successful in the woods and should be encouraged but where this fails young trees should be planted near mature trees to take over when they are felled or die. Adequate protection should be given to young trees against rabbits, deer and the public. Oak and ash could benefit from tree shelters and other trees should be kept weed free for 2 years by using "kerb" granules (propy-zamide) or "Roundup" (Glycophosphate).The species mix in the wood is at present so diverse that it has unprecedented amenity qualities, steep beech covered slopes carpeted with bluebells merge into more complex oak and birch banks. Woodland glades among the thickly planted trees give great variety to the wood and this patchwork should not be changed in the future to a forestry monoculture, new plantings should be carried out according to the principles of conservation. Commercial timber exploitation should only take place fortuitously when trees felled from necessity can be sold.

Conifers should be used in some areas where they can significantly increase the diversity of habitats within the wood by providing winter food and shelter for birds and insects, red squirrels in particular need mixed woodland to thrive. Non-native conifers like European Larch, Corsican Pine, Douglas Fir and Christmas Tree, all of which grow well in Durham should be planted, they can form a nurse crop for hard woods. The main element of the woods should remain broad leaf trees to maintain the

leafy nature of Durham City and conifers should not form a large part of the species mix. Sycamores grow particularly well in County Durham and they have become an invaluable amenity tree. Sycamores and Beech make up a large part of the species mix at all ages in the tree cycle this is because they germinate easily and can grow in deep shade, as seedlings they result in woods which are heavily shaded with little woodland flora, sycamore however is a host plant of many insects and studies in Hollingside Wood by the Department of Biological Sciences (1995), have shown that many bird species favour sycamore for this reason. Sycamore should be allowed to grow in some areas but they should be monitored to stop them invading other parts of the wood where they would be a detrimental effect on the ground flora, beech too should be controlled and the planting policy should be less favourable to beech than it has been in the past, other species like oak, birch, rowan, ash and sweet chestnut should be preferred.Greater forethought will have to go into planning for these species as they are much less tolerant of poor light conditions when young.The species mix should eventually reflect the hypothetical nature type for the area, this would be the type of woodland considered to be growing there before it was colonised by early man and the forest type is thought to have been a mixture of oak, elm and ash. However the University and the public gain so much from the variety of trees in the wood that the planting and trimming policy should favour oak, birch and ash and other conifers and other exotics as discussed also holly and yew will grow well in deep shade and they regenerate naturally in the woods and provide cover for wild-life in the winter.

Briar Roses, Hawthorn and sloes should be planted to restrict public access near the footpaths and entrances to the woods. Selective felling should be eradicated in

Hollingside Wood and Maiden Castle Wood.

Some birds and many invertebrates live on dead and rotting wood, this is provided by dead trees which are too inaccessible to fell or extract. In strict forestry terms all the large trees in the woods are over mature and of little timber value, as they age, branches die off and rot causing holes and cavities in the tree -so important to the ecology of the wood is this complex habitat structure that standing moribund timber increases the flora and fauna species by up to 10%, where unsound trees are no threat to the public or buildings or powerlines they should be left standing, dead trees on the edge of the woods should be felled however as they are unsightly in summer.

The practice of leaving the brash wood on site after felling which increases the fertility of the soil and provides temporary shelter for some animals should continue and the use of the chipper to tidy up unsightly areas by the footpaths, can also speed up the disappearing process. Paths should be dressed with materials which look natural and which do not affect the soil, for this reason dolomite chippings should be avoided and boiler ash and railway ballast should be used instead, paths should also not be tarmacadamed for aesthetic and ecological reasons too.

4.36.6 Sports and Public Access

Public access puts many pressures on the wood and the wildlife within. Being only 1.6 km from Durham City centre, the woods are extensively used by walkers, horse riders, cyclists, joggers and on occasions people with motorbikes. Most people stay on the public footpaths which criss-cross the wood but those who stray off the paths, even if they do no wilful damage, still do extensive damage to young trees, the woodland flora and cause erosion of the banks. Improved fencing in sensitive areas as well as

secure gates with stiles for pedestrians could help restrict cyclists, horses and vehicles. Planting undergrowth might help in some areas to keep people on the paths but generally it must be realised that the public do use the footpaths and this must be seen for its positive public relation value for the University.

More obvious destructive activities like poaching, shooting and camping are and should continue to be prohibited, at present no gun owner has permission to shoot in the woods because of the proximity of the colleges and the extensive public access.This policy should continue for the foreseeable future. Poaching too should be controlled and at present only one person has written permission (which is regularly reviewed) to take rabbits from the woods, incidents of poaching and badger digging should be reported to the police and badger digging to the R.S.P.C.A. who have powers of arrest in such cases.The woods are used by runners and joggers in large numbers who can cause a lot of damage by cutting corners and running off the footpaths and orienteering by its off road nature should not be encouraged.

The University is under pressure from the city and from its own members to allow sporting and other events in the wood, these usually take the form of walks or cross-country runs, discretion should be exercised before allowing events balancing their possible threat to research and conservation with their excellent P.R. value.

The Houghall Discovery Trail along the lower path of Hollingside wood demonstrates the excellent P.R. to be gained by public access in the woods, used by an estimated 5,000 people a year, display boards tell the public about different land uses and local history, this can only help the public appreciate the countryside on their doorstep and shows the University in a good light of caring about the

environment.Therefore while sport should be discouraged in the wood, controlled land limited public access is seen as beneficial.This however should not be expanded to providing picnic areas in the wood nor other facilities.There is also great potential in the woods for general education and improvement of public awareness of conservation matters.

4.36.7 Forestry and Timber

Larch and sycamore have been planted in small areas throughout the wood, these areas were clear felled about 45 years ago and the trees have been thinned and looked after well since then. In the winter of 1988/89 a large proportion of the larch was felled and sold for timber leaving good quality sycamore to grow on as a cash crop for the years 2020-2040. It would make good sense financially and for the wood as a whole to carry this plan through and fell the sycamores when mature this would involve minimal labour requirements for many years and the trees could be underplanted with species which could take over later.

The financial gains from the rest of the wood are limited by their prominence in the landscape, for example it would not be feasible to fell the valuable oaks in Maiden Castle Wood because of their importance to the wooded approach to Durham. Limited revenue can be generated from trees felled out of necessity and timber merchants will buy about a dozen large hardwood trees at a time, firewood sold during the winter also generates income and thinnings from the large plantation at Green Lane are used for fencing and tree stakes.Commercial forestry will decline in the woods during the next half century as the policy of conservation and amenity is worked through the tree cycle.

4.36.8 Fire

There is no resident labour to tackle a large fire should it occur in the woods. Durham County Fire Service have been briefed on the woodlands extent, water supplies and access and would be contacted in the event of a fire.

4.36.9 Policy for the future

Probably more important than any other conservation strategy, is the fact that the wildlife and flora depend on a critical area being maintained as woodland and complementary semi-wild habitat. Successful conservation in the wood depends a great deal on the size of the wood being large enough to accommodate varied populations of plants and animals for this reason, the wood should not be divided by new roads or developments nor should it's area be reduced in anyway.

Nearby developments which might threaten the wood, like the camping site at Houghall, should be limited too. Commercial exploitation, after the sycamore plantations have been felled, should be discontinued as discussed and a policy of selective or group felling should be practised so that natural regeneration ensures a varied age structure is maintained this will mean, densities will vary widely in the wood depending on the age and species of the trees. Conservation and Amenity principles will be given precedent over other interests which may have dominated in the past.The policy for Woodland Management should conform to the landscape principles set out by Brian Hakett in 1969, this mainly concerns the species mix in which hard woods should predominate and trees on the skyline (Mount Joy, Bucks Hill and Windmill Hill) should be given particular landscape significance.

Because the University benefits so much from its woodland setting it should be committed to its proper upkeep, this means that resources should be made available for skilled woodland staff and the proper arboricultural equipment necessary for woodland management work, training should also be incorporated into the career development of the woodmen and some grounds maintenance staff.Unskilled or volunteer labour should not be considered unless they belong to an organisation like the B.T.C.V.

Records of any previous woodland work are very scarce.To remedy this, a book should be kept with notes on work, like planting and felling. Research work by the Department of Biological Sciences, other organisations and the public too should be collected and kept within the woodland files for reference. Species lists would be helpful for teaching and to help monitor the conservation policy. Archival material should be sought on the history of the woods.

4.36.10 Durham University Woodlands - Green spaces of interest

4.36.11 Pinnock Hill and the Mineral Line (Grid Ref NZ275401)

These areas have particular amenity significance because they are at the edge of attractive footpaths.They also form a wildlife corridor to the woods at Houghall and so it is important to maintain a fairly dense planting. Replanting after thinning in 1998 was delayed by the dry spring, but oak, rowan and birch with Scots pine should be a suitable mixture for planting.The existing sycamore may cause major shading in the centre of the planting, so replanting should be concentrated at the edges.

4.36.12 Hollingside Wood (From the Mineral line to the Botanic Garden).

(Grid Ref NZ 274408)

4.36.12.1 *Background-* Hollinside wood joins into Great High Wood to the north east, it is listed as an ancient semi-natural woodland in the English Nature Ancient Woodland Inventory (provisional) for County Durham. Hollinside Wood is an extensive area of predominantly broadleaved ancient woodland dominated by mature *Quercus* spp. of limited age range.There is a distinct sub-canopy of younger trees particularly *Betula, llex aquifolium* with a scattered shrub layer, predominantly of *llex* and smaller tree saplings and an open grassy woodland floor with locally frequent *Rubus fruticosus* and *Lonicera periclymenum.* Locally areas are dominated by *Fragus sylvatica*, and the resulting shade minimises ground flora.The woodland has a good semi-natural character and development should be excluded from this area. Additional species include *Deschampsia flexuosa, Holcus sp. Tecrium scorodonia, Quercus robur, Larix decidua, Prunus avium, Equisetum sylvaticum, Dyopteris dilatata, Montia sibirica, Oxalis acetosella, Hyacinthoides non-scripta, Stellaria holostea, Anthoxanthum odoratum, Galium saxatilefruticosus* and *Chamerion angustifolium.* It seems likely that these latter areas lie on abandoned agricultural land and thus richer soils than are present on the woodland slopes.

The flora is well established with carpets of anemones and blue bells giving rise to its popular name of "Blue Bell Wood", Beech seedlings are common throughout the wood and could take over, should felling be necessary. Care should be taken when felling not to allow the wind to get in the wood by felling too many trees at once, especially near the brow of the hill.Oak and beech whips were used for replanting, they have grown well and are evidence of the success to be gained by replanting.

4.36.13 Hollingside Wood and Great High Wood

(Grid Ref NZ 276408, 279409 - from the Botanic Garden to Stockton Road)

Great High Wood is much more diverse than Hollingside Wood with sycamore taking over from beech and with small plantations of larch at Mount Joy and by Houghall fields. Many of the young trees are very crowded and there are sparse areas where elms have died and grass and bracken has taken over. The plantation of larch and sycamore at the bottom of the path from the Botanic Garden was cleared of larch in the spring of 1998. Replanting with oak and beech with some birch is necessary in the gaps.The unsightly state of this part of the wood will grow over and the sycamore should thicken out considerably. It should be felled when mature.

The woods needs minimal maintenance, but for thinning of the newly acquired larch plantation by Houghall fields and inspection of the trees lining Stockton Road which could present a hazard.The skyline along from Mount Joy Reservoir to Mount Joy Farm could be thickened up and underplanting with beech or oak which should be done within the next few years.

4.36.14 Little High Wood (Grid Ref NZ 275413)

Little High Wood forms a natural frame around the science site and from that point of view every effort should be made to preserve it. Over the next five years most of the work will have to be done in the next section of the wood to the east of the psychology road, here eight large sweet chestnut are succumbing to a progressive infection of honey fungus and it would benefit the younger trees if these were felled and extracted via the boiler house road. Some large beech and moribund elm need to be felled on the edge of the glade, north of psychology and replanting should be carried out where no young trees are present to take over. Regeneration is good in Little High Wood and it should take precedence over planting stock.

4.36.15 Maiden Castle Wood (Grid Ref NZ 284417)

The public use Maiden Castle Wood extensively and it comes under pressure from runners, poachers and vandals. Steps have been made in the steeper footpaths but some of the banks suffer from erosion.The oaks and large beech which grow on the lower slopes have considerable timber value which could never be realised because of their prominence in the landscape. The sycamores at the edge of Stockton Road must be assessed in the next five years as to their safety.Thinning will be necessary there which will be a costly exercise.The larch and beech plantation on top of the hill on the site of the prehistoric earthworks should be felled after consultation with the Department of Archaeology.They may recommend that the site be cleared of trees altogether. Extracting trees from this site will be very difficult.The Green Lane larch plantation should be thinned within the next 5 years too.

4.36.16 Potters Bank (Grid Ref NZ 265414)

There is a small plantation of even age oak on Potters Bank which belongs to the University. In 1988 sycamore seedlings were cut back here and the fences repaired. Oak should be underplanted here in readiness for their eventual felling.

4.36.17 St. Giles church (Grid Ref NZ 287426)

Here old elm and beech woodlands are being taken over by sycamore.The wood forms a beautiful backdrop for some of the starker buildings of the College of St.Hild and St. Bede and is important in that landscape context. Any work is subject to planning regulations and the University boundaries here are particularly vague. Three large elms were felled in 1987 and the trunks left on site as extraction was difficult. In 1989 the large beech by St.Giles church was pruned to stop it damaging the stonework of the church and in the next 5-10 years the fate of the volunteer sycamores on the bank

will have to be decided as they will eventually grow to be too big for their tenuous hold on the steep slope.

Vandals are a problem in this area and student accommodation at Grove House is particularly vulnerable. It is on the edge of a public footpath running from St.Giles church.Recent work tidying up the hedges and nearby trees has reduced vandalism considerably and this policy should continue.

4.37 **Graham sports centre** (Grid Ref NZ 286415)

4.37.1 Background

The Graham sports centre is situated to the south east of Durham City, near Maiden Castle Wood and opposite Houghall College.The centre provides sports facilities (cricket, football, rugby, tennis, hockey and gym) for Durham University students and the public. It is financed by the University and by fees paid, for use of the facilities. It was up until recently used as a training ground by Newcastle United football team, which gave £70,000 to spend on improvements to the football pitches (1997).

4.37.2 Current Management

The sports centre has an area of 60 hectares. This land is divided into 40ha on the sports centre site and 20 ha on the 'racecourse' site, (NZ 282424) across the river. The land is classed as amenity sports ground. As a result costs are higher than maintaining a less demanding grassland site.The majority of the grassed areas are sown with a high standard ryegrass renovation mix and the grass is mown to an height of between 1.5-5cm, from the middle of the playing surface to the border of the playing surface respectively. There are 6 grounds maintenance staff including the head groundkeeper employed in keeping the grass up to standard. This includes the fine turf areas, such as the football fields, cricket fields/cricket squares and practice squares. Not all of the land is intensively managed though, there is also a network of hedges that are planted around the boundaries of the football and rugby field. The hedges support a variety of common wildlife species, including wrens, sparrows, shrews, spiders and butterflies. The banks along the River Wear are tree lined and the grass here is mown during summer. Several different operations are carried out at the sports centre:-

- Correct Compaction- To improve duration and drainage and hence sward growth and playability (spike regularly once a month.
- Control thatch (scarifying) - Dead plant material on top of living grass surface not taking adequate root, (can occur with the use of sprinklers. To improve surface drainage and grass growth and limit disease. (Harrow, rake and maintain pH at acceptable levels).

- Feed - To maintain sturdy growth under mowing regimes and hard wear. (£2000 on fertilizer (1996). Apply fertilizer e.g. at 250 kg/ha apprx in summer and more dressing if needed.
- Repair Work - To maintain an interactive playing surface; speed up natural regeneration, prevent weed ingress. Cultivate work areas and reseed or turf (May/June) badly damaged parts top dress and overseed minor damage during winter (£4000, 1996)
- Improve Drainage - Spike; top dress work, layer of sand.

4.37.3 Future Management

The site is primarily a sports facility and as a result would not be thought of as encouraging a natural element to the site, as there is generally too much disturbance from sports activities. Limited success however, has been made in the past with a small grassed bank area left over to wildflowers, planted by the Biology Department in 1996. Unfortunately this area had to be abandoned as it became overrun and choked with Himalayan Balsam. A similar scheme could be tried again, although before planting, spraying the area with a weak herbicide, first to kill off Himalayan Balsam or Bindweed still remaining. The hedges around the perimeter of the site are mainly hawthorn but contain a wide variety of wildlife and should be sympathetically managed to protect animal life, (Hedge cutting left until September and if possible cut by hand).

The River Wear is prone to flooding in this area, which is low lying, this prompted vital maintenance work, carried out in 1996. Work consisted of reinforcement of the river bank adjacent to Maiden Castle footbridge: high river levels during 1995 had washed out the bank behind the bridge abutment and collapsed the main drainage

outfall. After discussion with the National Rivers Authority (now the Environment Agency) engineers- Ove Arup and Partners designed a reinforcement scheme using gabions (steel mesh baskets filled with stone, **Figure 4.39**), which was then planted over. The main contractor was Dorin Construction and the total cost was £85k (Estates and Buildings Report,1996).

Fig. 4.39 Reinforcement of the Riverbanks (Grid Ref NZ 284419) to prevent further bank erosion using steel gabions

4.37.4 Recommendations

The following recommendations are suggested for sympathetic environmental management for the Graham Sports Centre:-

- The establishment of a wildflower habitat along the bank with a less intensive mowing regime along and in the area of the banks.
- Grass cuttings being recycled or composted or mulched.
- Less intensive use of herbicides and specialist foreign grass species that compete with the native grasses.
- Hedge management to be in keeping with conservation practices.

4.37.5 Summary

On the site, the banks bordering the sports fields would really be the only suitable places where any wild areas would be encouraged. Everywhere else the fields come under strict management, although less herbicide use along the edges of the fields and fringe areas up to Maiden Castle Wood would not effect current management. Also path management on the site to stop erosion by joggers will need to be carried out as some parts of the path have deteriorated.

4.38 The Botanic Garden (Grid Ref NZ 274409)

4.38.1 Background

The University of Durham Botanic Garden covers 7.2 hectares among the woodland and countryside south of Durham City. The garden is open to the public and also has disabled visitor facilities and routes accessible by wheelchair. In 1996, an estimated 60,000 people visited the garden, including 2,000 school children, making it among the largest visitor attractions in Durham City (Estates and Buildings Report,1996). The popularity of the garden is in part due to regular media coverage, publicity literature sent to prospective students and the garden's Internet Home Page (which was visited over 5000 times in 1996-97) (J.Cobb 1997).

Features of the Garden include a Tropical House, Cactus House, woodland walks,

North American Tree Trail (opened 1994), North American arboretum, the Prince Bishop's Garden, the Rose Garden, woodland Garden,Gazebo Garden and 'Himalayan Valley'.

The first botanic garden in Durham was founded in 1925, when the grounds around the science laboratories were laid out as an experimental garden. As the sciences expanded within the University and more buildings were constructed, the garden decreased proportionately and it was decided in 1969 to move the garden to a new site, where it could develop undisturbed and achieve an identity of its own.Work on the new garden situated in Hollingside lane commenced in 1971, under the guidance of Professor Donald Boulter (Professor of Biological Sciences,1966-91) and was one of the first gardens in the country to reflect the environmental concerns of the twentieth century. The garden's mission statement set out by Professor Boulter in 1982 was as follows:-

The garden should:-

- Support the teaching and research of the University.
- Be a centre of horticultural excellence.
- Be a centre for conservation education.
- Act as a link with an amenity for the north east community.

The use of the garden for teaching and research has expanded rapidly, and the garden is an important resource for University research and teaching, particularly in the department of Biological Sciences. It is funded by the University and visitor sales from the Garden and has received revenue from grants given by The Biotechnology and Biological Sciences Research Council (B.B.S.R.C.) to develop a schools programme (1997).

Current projects include:-

- Research into pest-resistant crops such as potatoes and rice.
- Research on oil seed rape that could become the raw material of biodegradable plastics.

The garden is spatially divided into a north section and a south section :-

4.38.2 North Section

The north section is devoted mostly to British and European species, conservation programmes, plants of horticultural merit and living exhibits of special interest such as modern drug plants. The garden here slopes to the south west and gets the full force of the prevailing wind, the soil is a mixture of glacial sands and clays and the pH is 6.5 (acidic) average rainfall is about 650mm.Access to this north section is from Hollinside Lane. In this location, there is a mixture of deciduous woodland and evergreen, beech, oak, sycamore, larch, birch and holly.

4.38.3 South Section

The south section is situated at the end of Hollingside Lane and is divided into two areas. The first being the North American collection, it is a ridged field surrounded by a sycamore and larch plantation, established in 1947, pH is about 7.2. Some planting has already been done and nine different woodlands are planted to represent major dominant forest types of North America. The second area, to the west is the Sino-Himalayan collection, is a steeply sided valley with a stream running along its length, the eastern slopes are planted with sycamore and larch, again dating from 1947, there is evidence of early mining activities and the pH drops in places to 4.5 (very acidic). Part of the lower lawn area near to the glasshouses shows evidence of ridge and furrow (rigge and furrow) ploughing thought to date from the Napoleonic

times. Along the grassy bank near to the glasshouses there are white flowers of wild hieracia, harebells *Campanula rotundifolia* and other native grassland plants. Primroses were transplanted from a development site, after they had flowered in 1973 and are now successfully established here. The overflow from the pond, fed by a spring, soaks into this bank before following the ditch to the main boundary stream, this wetland environment has allowed moisture loving plants to thrive. Between the boundary stream and the copse, are some Christmas trees *Picea abies*. The copse is the only sheltered part of the garden and demonstrates how effective plants are in creating microclimates, winter and early Spring flowering plants also grow here, where the protection gives shelter to both flowers and visitors. On the grassy bank, facing the copse, are to be found a collection of willows, all propagated by cuttings, these Salix species are from County Durham and represent both species and some of the hybrids that occur.

4.38.4 Current Management

The Garden is part of the Estates and Buildings Department of the University. A budget of £7,000 (1997) was spent on grounds maintenance supplies, although this figure can vary (does not include maintenance of the machinery or running and overheads of the visitor centre).

The horticultural staff consider conservation to be a major theme in the management of the garden, this can be illustrated with one such example, the North American collection, which stands in an additional 5 hectares of grassland. The grassland is managed as a hay meadow and cut only once a year this allows wild flowers such as cowslip (*Primula veris*), campion (*Silene spp*), ox-eye daisy (*Chrysanthemum leucantheum*) and lady'smock (*Cardamine pratensis*) to thrive,which attract birds and

butterflies.

Rather than cultivate endangered or rare British wild flowers in pots or formal beds, the botanic garden is attempting to create artificially a natural habitat, in which to establish certain rare plants and encourage them to thrive, orchids and other rare plants have been slowly introduced -the importance of this exercise is that there is now a collection of plants available for study, and to use in conservation programmes and interpretation.

Herbicide and pesticide usage is kept to a minimum and wherever possible natural control is preferred (e.g. use of ladybirds to control aphids).

Rare breeds of sheep graze the North American arboretum, where they act as an alternative to machine mowing and also provide additional educational and visitor interest. They are owned by Louisa Gidney of the Archaeology Department, who studies their growth and teeth as part of her comparative studies with Saxon livestock. The sheep are in the garden annually from July to March, elsewhere grass is cut using conventional lawn mowers.The models favoured by the garden staff are the Etesia PKTB/PBTS/PST -they have 2 stroke engines and are very light to handle and so are ideal for banks and the varied landscape areas in the garden.

The amount of visitors to the garden generates a lot of litter. At the height of the 'visitor season' (during summer) there is a litter patrol every Monday morning to ensure the garden is kept clean, there is also a policy of encouraging litter to be taken home by visitors and to this end there are only a few bins provided in the garden.

Vandalism again is not a problem from the visitors this could be partly due to the fact that 70% are over 55 (J . Cobb 1997). Other groups are families and students/academics. Although a few problems have occurred with students,

getting in to the Garden and inadvertently trampling the plants, plants have also been stolen from the garden but this is a relatively small scale problem, notably some conifers from the Alpine Garden (Estates & Buildings Report 1996).

4.38.5 Future Management

In terms of future management. The Botanic garden staff have plans to improve teaching and research facilities, at the present time the garden is already utilised by local school children and teachers, as it provides worksheets and identification plant sheets, as well as the ' Hollingside woodland trail' leaflets. The garden is already a facility used by the University's Biological Department for Botanic study lectures and tutorials. In the future, the Botanic Garden hopes to recycle vegetative material, known as green mulching (**see Appendix 13**), this practice is already carried out by Darlington Council Estates Management Department. A management plan has been drawn up for better woodland management, this includes all the currently owned University woodland. The woodland management plan also investigates better habitat management, for the flora and fauna that reside within it, with special mention for red squirrel habitat management.The Botanic Garden also has plans to increase numbers of visitors in the next five years and stage business conferences and educational events to increase revenue.

4.38.6 Recommendations

The following recommendations are suggested for improving facilities and maintenance improvements to the Botanic garden:-

- The Botanic Garden could be used as a venue for staging after dinner talks and business conferences.
- More interaction with staff and visitors, in terms of providing names of plants and other useful advice.

- Develop a schools programme linked to the national curriculum with a guide and itinerary.
- Go into partnership with the local Authority for imaginative schemes which benefit both organisations like the Tourist Bus Scheme and Education.
- Green mulching to reuse vegetation and grass cuttings to make compost and chippings to be used on herbaceous beds.

4.39 Old Durham, Gilesgate Field (Grid Ref NZ 295422)

4.39.1 Background

Richard Hopp's family have farmed the land around Old Durham for over 300 years. Some of this land, however has been lost to the Sherburn Road Estate.

Old Durham is 1.6km east of the City (**Figure 4.40**). It can be reached by the riverside path (15 minutes walk), or by a lane leading south from Sherburn Road. River trips on the river cruiser 'Prince Bishop' stop at Strawberry Landing in Old Durham. Old Durham is part of the designated conservation 'bowl' of Durham City. As well as conservation value, the area also has historic value, as a Roman settlement was believed to have been located there, this was further reinforced when in 1940 a Roman Bath House was discovered. A Roman road called 'Cades Road' ran somewhere in the vicinity, but in the immediate area of Old Durham, the course of the road has been lost (**see Appendix 14**). Another possible ancient site in Old Durham is nearby Pelaw Wood, Pelaw is said to derive its name from Pele Law meaning 'Fort Hill'. In later years Old Durham became the site of a seventeenth century mansion belonging to the Heath family, the mansion was demolished in the following century but its terraced gardens still remain.

Fig. 4.40 A view of Old Durham from the edge of Gilesgate Field (Grid Ref NZ 295422), (note Graham sports centre and white house - formerly the Pineapple inn)

4.39.2 History of Old Durham

By the twelfth century William, rector of St Nicholas, held the manor of Old Durham.

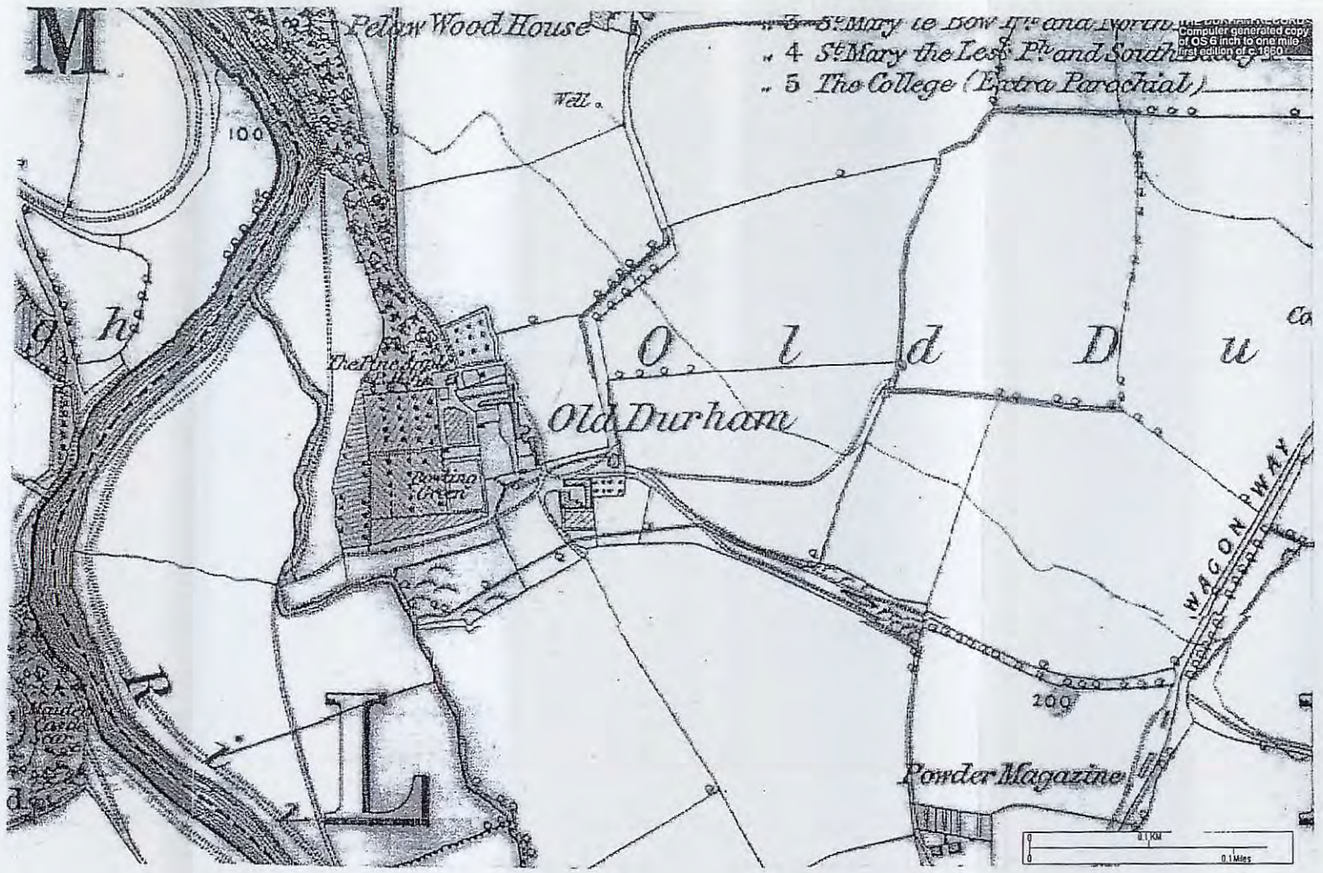
In 1443, Bishop Robert Neville impropriated the rector of St Nicholas to Kepier Hospital, whilst the income from Old Durham manor augmented the revenues of the hospital. In 1447 Robert Booth, Master of Kepier leased the manor to his brother

Richard for 99 years, reserving the timber of Pelaw Wood and £10 rent. When religious houses were dissolved in 1546, the Crown confiscated Kepier Hospital property. After passing through several hands, John Heath a wealthy Protestant merchant acquired it in 1569. John Heath died in 1591 and his son John Heath II succeeded him. The manor passed through four other John Heath's, until it came into the possession of John Tempest II, after his death, John Tempest III inherited the estates, at Old Durham he employed a gardener. After he died his son, John Tempest IV inherited the estate. An estate plan drawn up for him in September 1776, shows there were two upper walled gardens planted with a path alongside their joint long western wall,with the gardens sloping towards Old Durham Beck. A formal garden with geometrically laid out walks north of the mansion and site adjacent to Pelaw Woods and a bridle road leading from Durham across a ford and skirting the western side of the gardens to join the present lane at Old Durham farm. (M. Johnson 1992). By the 1780s the house was in disrepair but the gardens were used regularly for recreation. The historian, Robert Surtees, who died in 1834, wrote:

> *The house of Old Durham, the deserted seat of the Heaths and Tempests, stands warm and sheltered.... The main body of the house has been taken down; the gardens only remain formed into sloping banks and long terraces. An old summerhouse, with a small bay-window, has the initials J*[ohn] *H*[eath]
>
> (M. Johnson 1992).

In 1849 the Londonderry's sank the Lord Ernest pit to the Hutton seam in the area, and production continued here until the end of the nineteenth century.

The first OS map of 1857 shows the north formal garden replanted as an orchard; the south walled garden was a bowling green with the gazebo (its first appearance on a plan or a map, **Figure 4.41 a, b**) at the west end of a raised terrace.Excavations here in the 1960s revealed stone walls with medieval plaster on them.



(a)

(b)

Fig. 4.41 Ordnance Survey map sections of Old Durham (grid ref NZ289419), (18(a, and present, b). The map section of 1860 shows the Pineapple Inn and bowling green (note also there is no bridge at Maiden Castle and no housing north of Old Durham). The present O.S. map shows the same section, the pineapple Inn is now a private house, there is no bowling green and Sherburn Road housing Estate now ex to the north (Durham Record 1997)

A plan of 1812 shows Old Durham divided into farms.Other details are omitted, but the gardens and adjoining house were let to 'Jos' Robinson.

A 1924 Guide to Durham, advertises Old Durham Gardens; Dancing, putting green, running track, tennis courts, ices, tea gardens and full licensed free house-parties catered.This was the Pineapple Inn, built in 1827 and sited on part of the manor house site, it remained a public house until the license was lost in 1926 owing to its then unfavourable reputation. Older residents of Durham remember the running track below the slope of the lower garden, with a small building for equipment against the stone wall at the north end (M. Johnson 1992).

4.39.3 Recent History

In 1893 the North Eastern Railway Company, opened a station at Elvet, branching off the line at Sherburn, this line crossed the Old Durham Estate and ran across the south-west corner of the lower garden on an embankment (still remaining). At the end of its life in the mid-1950s, it was used solely for carrying passengers to and from the miners gala. In 1918 the seventh Marquis of Londonderry sold the Old Durham Estate in three lots, chiefly to their former tenants, the Hopps family, who still own most of it today.

Part of the gardens was sold to St Hild's College in the 1930s for a proposed extension, never achieved and sold to the City Council in 1985, when Richard Hopps sold the adjacent land to enable restoration.

Recent archaeological work has revealed a series of flights of 2.7 metres wide steps descending from the gazebo.The wall to the north is ancient; at its north end (in a private garden) are the remains of what may have been a garderobe, and blocked mullioned windows occur in various places in the neighbouring walls, all on private

property. Built into the wall to the east of the Pineapple inn is a clear pediment and much weathered coat of arms.The adjacent farm buildings are seventeenth to eighteenth century (M . Johnson 1992).

4.39.4 Current Management

The land is mostly arable in type. Part of the farm land is on the site of the old mineral lines which traverse this whole area.

There are a few outlying buildings on the farm, these could be turned into holiday homes, but local vandalism in this area may be putting potential renovators off.

Part of the land is made up of gorse scrub heathland, which graduates into Pelaw wood and has potential as good green space land.The City Council has planted tree belts composed of whips and saplings but most of these have been pulled up or destroyed by vandals. The heathland is made up of various species of heather (*Erica* spp.), rough meadow grass, gorse and bracken. The scrub area gives way to rough grazing land nearer the housing estate, here there is a problem with fly tipping and dumping of domestic/ household waste and garden waste (**Figure 4.42**).

Shopping trolleys are frequently left here as is waste oil - not only damaging to the environment and wildlife, but also dangerous to children, who often play here (**Figure 4.43**).

This area, near to the housing estate is used by people for dog walking and as a short cut across the estate and to the nearby Laurel Avenue infant school. Sometimes the area is used by teenagers for scrambling on motorbikes, but this is fairly infrequent. Further away from the housing estate, on 'Gilesgate field' horses graze, although not owned by Mr Hopps, he has had no success in moving them, they are approachable and seem to be popular with people walking through the area. There is no form of organised management on Gilesgate field.

Fig. 4.42 Gilesgate Field, showing remains of dumped oil and burnt grass

Fig. 4.43 Flytipped material and shopping trolleys in Old Durham Beck

4.39.5 Future Management

Old Durham is very important, not only because it forms part of the 'Durham Bowl' Heritage Site, but also because it is significant historically. Legislation in the County Structure Plan Review covers the area as a Conservation Area so the usual building laws and conservation policies apply.

At present Durham City Council are restoring the terraced gardens at Old Durham to their original former state (**Figure 4.44 and 4.45**). When the project is completed the gardens will become a tourist attraction for visitors to Durham.

The area is generally undisturbed, but the most damaging aspects on the land in the area of Gilesgate Field are from the results of fly tipping and general large scale dumping. This usually means dangerous glass bottles, cans and non degradable plastics are left lying around, dangerous for humans and animals alike and polluting to the immediate environment. Another danger is fires which are lit, using rubbish and waste oil. At present Mr Hopps is contemplating selling the farm. If this happens, then the fields and fringe areas around the housing estate might be open to new management, this could be funded with a 'set aside scheme', Farm Woodland scheme (F.W.S.) or Countryside Stewardship scheme.

4.39.6 Recommendations

To improve the aesthetic appeal and to educate visitors to Old Durham, the following recommendations have been suggested:-

- More trees planted on the remains of the treebelt, using older whips or young trees instead of saplings.
- 'Fringe' areas around Gilesgate Field and the housing estate cleaned up.

Fig. 4.44 Old Durham Gardens (November 1997). The gardens are in the process of being replanted to their original 18th Century plan (**see figure 4.45**). Garden species consist of roses, jasmin and fruit trees, Shropshire prune and Golden pippin. (Roberts 1994)

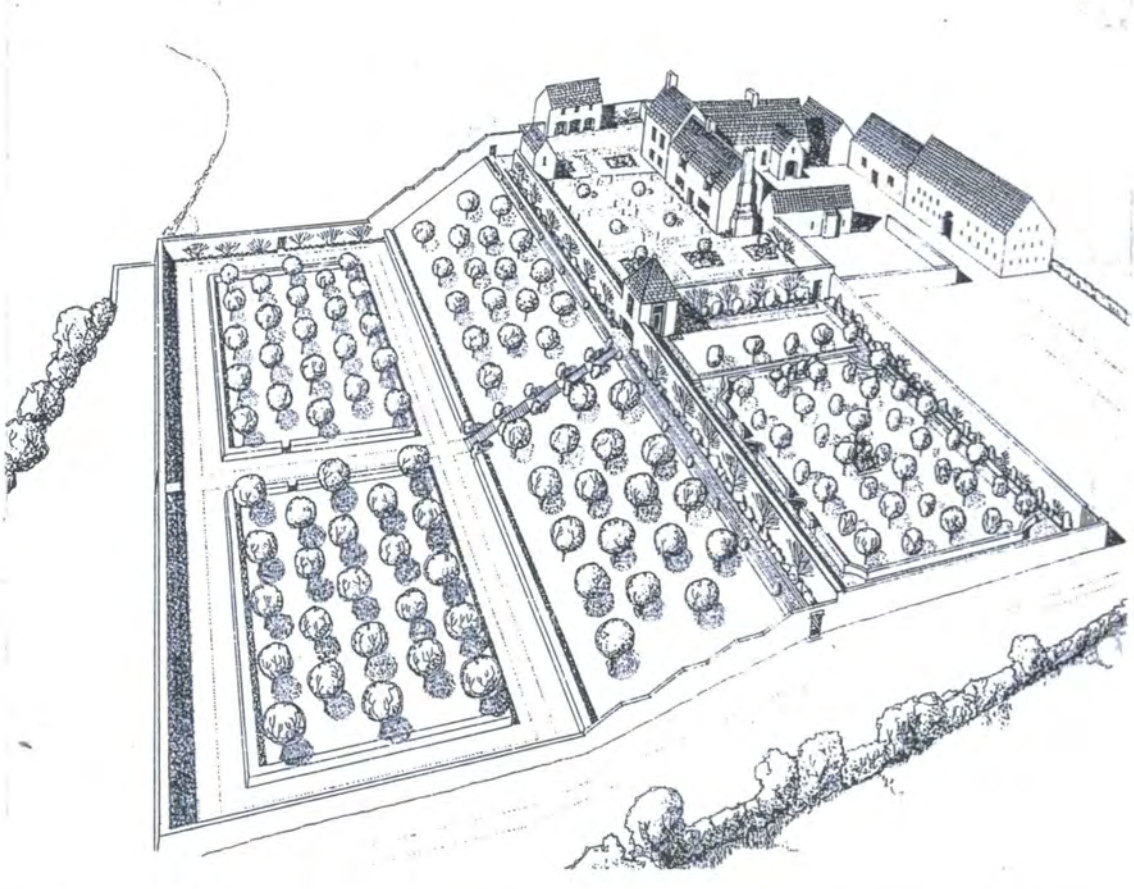


Fig. 4.45 Old Durham Gardens as they may have appeared in the early years of the 18th Century (Roberts, 1994)

- Fines for fly tipping and dumping, planting of robust tree saplings (with stakes) to break up the uniformity of the area and increase its aesthetic appeal.
- Erect information signs to inform about the terraced gardens, mansion house, mineral lines and the natural history of Pelaw Wood and the heathland site.

5.0 EFFECTS OF NOISE ON GREEN SPACE IN DURHAM CITY

Noise pollution is evaluated by reference to the decibel (dB) scale, which is a logarithmic scale of sound pressure levels in the atmosphere. Most commonly, 'A-weighted decibel measurements are presented - dB(A) - as these approximate to the hearing threshold of the human ear.The most widely used summary measure is the continuous equivalent level, L_{EQ}.

Noise level nuisance is caused not only by increases in the average levels, but also by a wide range of noise levels. Residents in rural areas, accustomed to only a low level of background noise, may prove sensitive to levels which would not disturb city inhabitants, whose degree of acclimatisation is much greater. It is therefore important to observe the amount by which new peak levels are likely to exceed background levels and pre-existing maxima.

The range of noise events is often expressed in terms of the (background) level exceeded for 90 or 95 per cent of the time (L_{90} or L_{95}) and the peak exceeded for only 10 or 5 per cent of the time (L_{10} or L_5). Commonly, analysts first select locations likely to be sensitive to noise from a proposed development (such as hospitals and schools).

In practice it is virtually impossible to obtain sound levels below 25dB.The rustling of leaves corresponds to about 35dB, while bird song is about 45dB. (Effects of Traffic and Roads on the Environment in Urban Areas: OECD,1995)

5.1 Definitions

5.1.1 Decibels

Humans can detect an extremely wide range of sounds- about a million units if measured in Pascal's (the unit of pressure). In order to make this more manageable sound is normally measured in decibel scale.This is a logarithmic ratio and as such the following should be noted:-

- An increase in sound level of 10dB will be perceived as a doubling in the apparent loudness of a sound.
- If two identical sources are placed side by side the increase in sound pressure will be 3dB. For instance if one machine emits 70dB at five metres then two machines will emit 73dB at five metres.
- Typically a doubling of traffic flow produces a 3dB change in noise level. The baseline noise levels therefore take on additional significance. (Report of inquiry into Lorries, people and the Environment, Newcastle City Council, 1994).

5.1.2 Explanations of terms

The following terms and symbols are used in standard noise surveys and explanations for them appear below:-

- dB: Decibels - the standard unit used to measure sound/noise levels.
- (A): Indicates that a weighting (known as the 'A' weighting has been used to modify the basic decibel reading. Noises of higher pitch (frequency) are recorded as being louder than those of lower

pitch.This approximates to the way in which humans respond to sound.

- L_{EQ}: The average noise level over a given period of time (5 minutes for the following readings).
- L_{MAX}: The average noise level recorded during the period of measurement.
- L_{10}: The noise level exceeded for 10% of the period of measurement.
- L_{50}: The noise level exceeded for 50% of the period of measurement.
- L_{90}: The noise level exceeded for 90% of the period of measurement (used as a standard measure of background noise level).
- L_{95}: The noise level exceeded for 95% of the period of measurement.

5.2 Methodology

This section examines noise levels from roads and other public areas to discover if disturbance is caused to green space sites in Durham City.

Noise meter readings were carried out in the locality of the study area using a CEL-368-Type 2 Environmental Noise Meter.The noise survey was implemented using sampling points based on a five hundred metre grid, at each location, noise meter readings were carried out for a duration of five minutes at a time (**see Appendix 15**).

The sample point readings were taken between 10 am and 6pm on 10^{th},18^{th} and 20^{th} of July 1997.

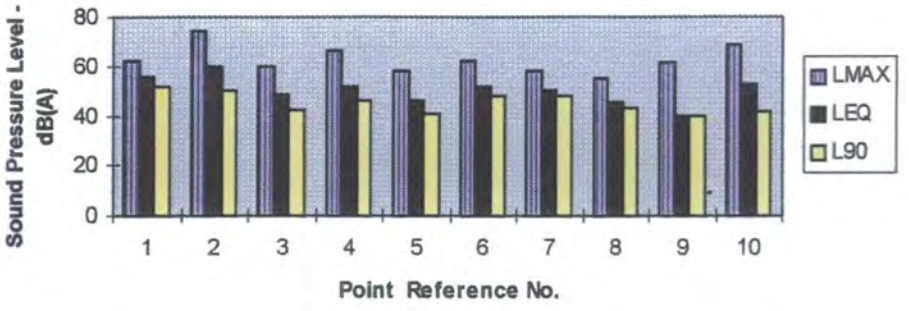
After the readings had been recorded the results were graphed (**Figure 5.1**) .

The reasons for carrying out the noise level readings were twofold. Firstly to get a general picture of the level of noise in different parts of the City of Durham and secondly, if more noise level experiments are carried out in the city, then these and subsequent noise level readings can be used to build up a noise level contour map, useful for planning of new green space or other future developments -as Durham expands and changes as a city, then so will noise levels, this has also to be taken into account.

The noise levels showed degrees of variation, throughout the sample points in different areas of the city. This is to be expected, and, generally as a rule built up areas/urban areas are more noisy than the countryside. The sample points next to green spaces were focused upon, but with the limited range of the survey, the results can only act as a guide, as to whether disturbance to people and wildlife by noise levels recorded, is a real issue in the green spaces. In order to investigate levels of noise on green spaces more fully, an inventory of wildlife recorded, their sensitivity to disturbance, interviews with the public and also multiple noise readings would have to be taken, at different times of the day as well as on different days and months.

Also recorded were the ten sample sites with the highest average (L_{MAX}) noise levels during the five minute measuring time (**Figure 5.2**).

(a)



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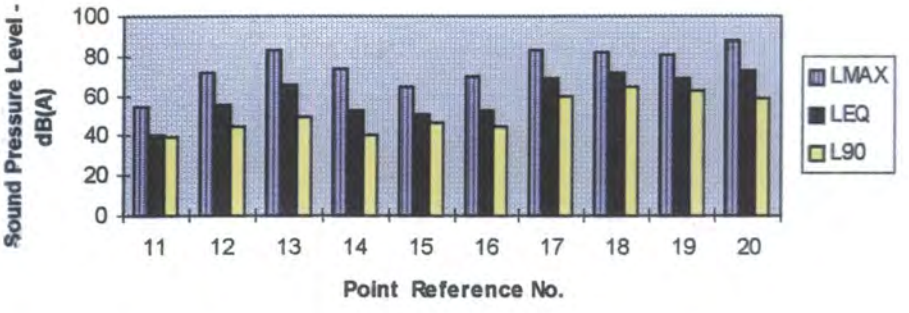

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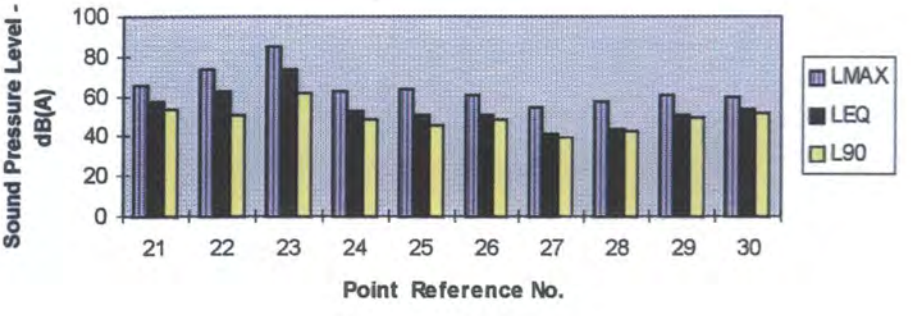


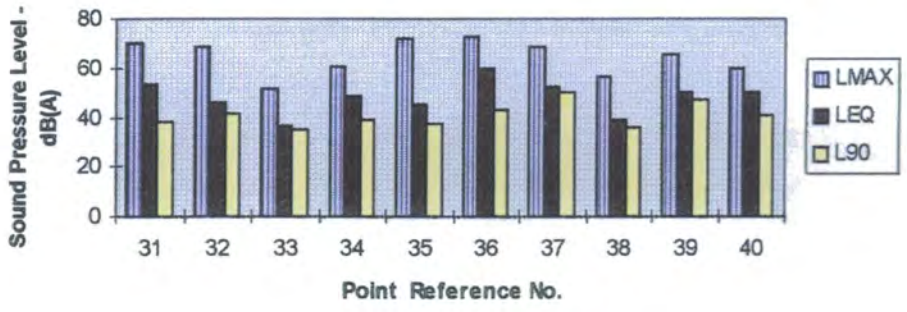
Fig. 5.1 Graphs of Sound Pressure Level dB (A) values recorded in Durham City (**see Appendix 15**) for values and point reference locations)

(a) Sound Pressure Level values at point references 1-10.

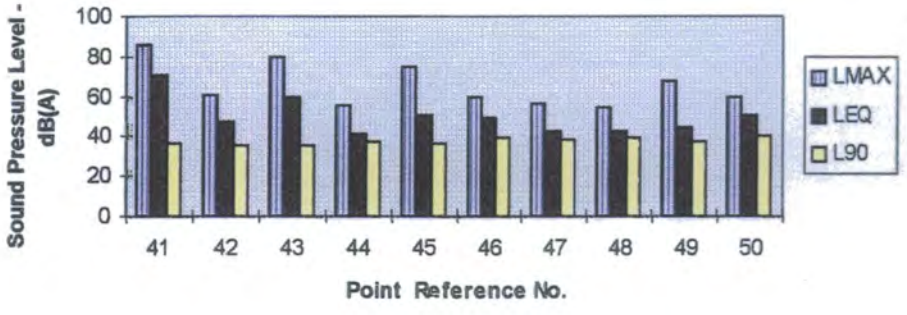
(b) Sound Pressure Level values at point references 11- 20.

(c) Sound Pressure Level values at point references 21- 30.

(d)



(e)



(f)

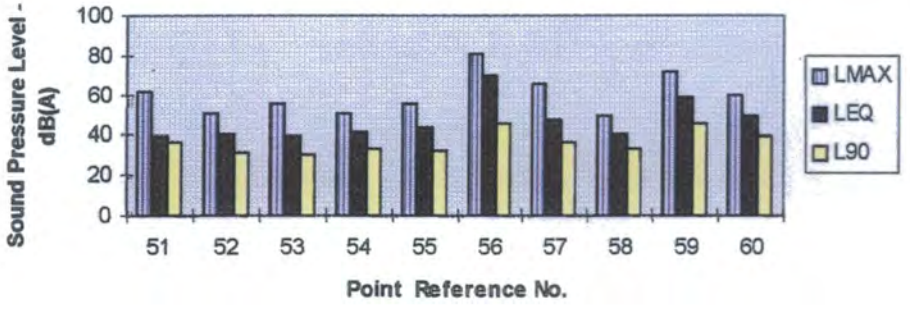


Fig. 5.1 Continued

(d) Sound Pressure Level values at point references 31- 40.

(e) Sound Pressure Level values at point references 41-50.

(f) Sound Pressure Level values at point references 51-60.

Location	Grid Ref
1. Newcastle Road	NZ 260440
2. Newton Hall (railway embankment)	NZ 281446
3. North Road/ Milburngate junction	NZ 272426
4. Elvet Hill	NZ 271411
5. St Monica Road	NZ 262425
6. Friarside	NZ 261431
7. Whitesmocks	NZ 258435
8. Houghall College (path)	NZ 287411
9. Aykley Heads	NZ 271435
10. Science Site	NZ 276415

(**Fig 5.2**) shows the ten sites in the Durham City noise level survey with the highest average noise levels (L_{MAX}) recorded over the five minute duration period.

These sample points were recorded, either along major traffic areas or near to major traffic areas. Traffic generates the most amount of continuous noise in Durham City. However noise levels decrease rapidly for every metre away from the road.

The noise levels were taken in July, when the city's traffic is increased by tourist ingress. If taken at other times of the year the readings may show significant differences.

At Newton Hall trains increase noise levels on occasions, but these are known as 'peak events' and once the train has passed noise levels decrease again, overall the noise level is low for 90% of the time. Akyley Heads is a busy sports centre, (situated outside of Durham City and near to a small amenity woodland belt), with a running track and golfing facilities, it can be quiet out of season, but during summer can be noisy. A maximum level(L_{MAX}) of 79.5 dB(A) was recorded for the five minutes but

along the perimeter of the sports field to the tree belt, the noise decreased dramatically to 35.5 dB(A), this could possibly be due to the trees absorbing some of the sound. Generally high levels were recorded where there were people engaged in activities or children at play, 72.9dB(A), playing field near St George's field (Grid Ref NZ 267449). Generally lower readings were recorded at the riverbanks (54.3) and woodlands that surrounded them (Pelaw Wood, 57.5), Old Durham (50.5), where again, trees seem to prove an effective noise reducing agent.

According to the Institute of Environmental Assessment, a day time noise level above 60dB(A) would need some mitigating factors. This is based on the fact that nuisance is often caused by changes in flow or types of vehicles as much as by an increase in the steady flow of traffic. The figure is less at night or near sensitive areas.

Noise mitigation measures could be recommended for the following areas. Science Site (screen of trees) and along major roads in Durham, including more street trees, (Warning: mitigation measures used, such as a screen of trees or willow walls may cut down visibility on busy roads) .Generally many of Durham's green spaces, particularly within the peninsula area, do not allow cars and have to be reached on foot, so this has restricted noise levels. In Policy 40 in the County Durham Structure Plan Review there is provision for including noise level monitoring in accordance with present environmental standards.

Policy 40 in the County Durham Structure Plan Review states:-

> *The County Council in the design, phasing, programming and construction of new transport infrastructure will seek to minimise any adverse environmental impacts.*

5.3 Recommendations

Noise level mitigation measures are suggested if noise is excessive, this can only be established after measuring the background or ambient noise level. Mitigation measures for both excessive noise and vibration can take a number of forms, these include:-

- Making as much use as possible of the topography and natural screening. The use of "willow walls" (**Figure 5.3**).
- Using "quiet" road surfaces.
- Using environmental barriers.
- Designing roads to ensure free flowing traffic.
- Landscape green sites, where the noise level is found to be excessive or disturbing.

Measures to improve noise surveys:-

- Measure noise levels at various different locations throughout the district with a view to identifying trends.
- Currently there is no systematic monitoring and evaluation of different methods used by Councils. Integration of noise data between different Councils, would help to build up a picture of noise levels in areas.
- The availability of national noise data on all sites of scientific importance is required so that the relative quality of the affected sites may be evaluated
- Increased research into artificial noise absorption materials to work inconjunction with natural materials, such as willow walls would further protect green spaces and its wildlife

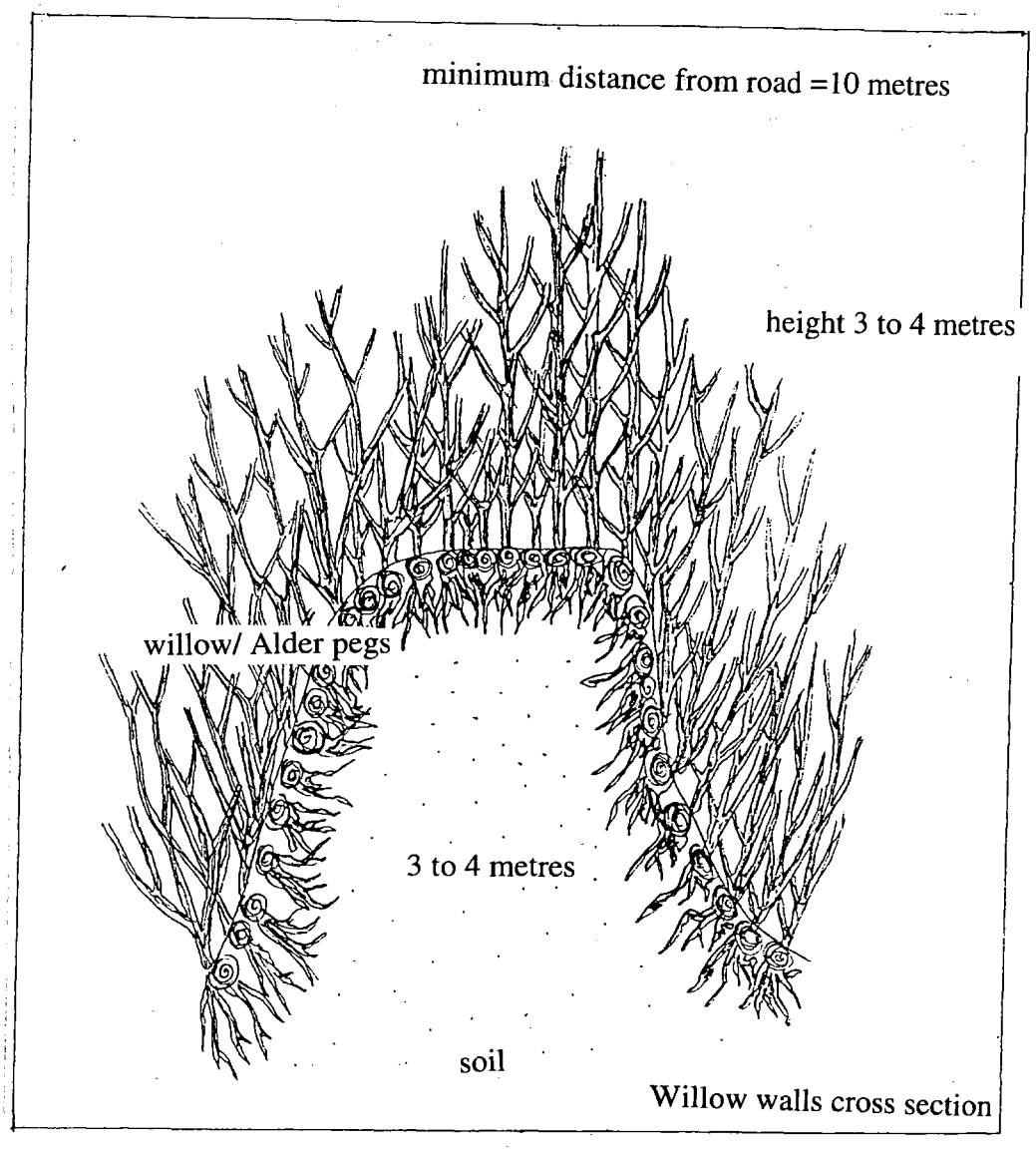


Fig. 5.3 Willow walls are an effective 'natural' noise mitigation measure

Using willow/alder 'pegs' and 'spiling' the willow, a thick barrier can be developed for city green space providing a visual and sound barrier to the traffic. Once the woven barrier is in place and the 'heart' filled with soil – trees can be planted into the 'spiling', this has the effect of creating a natural looking and also effective noise mitigation device

6.0 EFFECTS OF pH ON GREEN SPACE IN DURHAM CITY

The soil reaction, or pH, is a measure of the hydrogen ion concentration of the soil solution. Soil reaction is a simple and direct measure of the overall chemical condition of the soil (Brady 1990). It has been found that the soil reaction is correlated with the solubility of nutrient compounds and hence their availability to plants indicates the general character of the organism population and the level of its activity and in turn, the rate and degree of organic matter decomposition and infers the nitrogen mineralization rate as well as the base saturation percentage (Brady 1990). Soil reaction is also correlated with the solubility's and concentrations of toxic substances. Water dissociates into H^+ (more properly H_3O^+) and OH^- ions and the concentrations of the two ions are equal in pure water and considered to be neutral. Since only one water molecule in 554 million ionises, the concentration value is very small, to overcome the use of small numbers the pH scale has been devised. The pH is defined as the log of the reciprocal of the hydrogen ion concentration and the value becomes a whole number. At neutrality water has a pH of 7, a pH value of less than 7 indicates a greater concentration of hydrogen ions than hydroxyl ions and the solution is acid. When the pH is greater than 7, the hydroxyl ions are present in greater concentration and the solution is alkaline (or basic). A pH of 7 is neutral; lower values indicate acidic soil and higher values alkaline soil.

6.1 Methodology

pH readings were carried out in the locality of the study area, using a standard pH meter (this consisted of a probe inserted into the ground, the pH is indicated on a dial), giving a simple visual non digital reading.

The pH survey was implemented using sampling points based on a five hundred metre grid.

The sample point readings were taken on the 10th, 18th and 20th of July 1997. After collection of the readings, the results were graphed (**Figure 6.1**).

At each location the pH, throughout the sample points averaged around 6.2, which is a moderately good pH for most plants to grow in.The pH rarely rose above 7 (neutral) throughout the survey (**see Appendix 15b**).

As the investigation was done to give a general idea of the pH of the soil in which plants are growing in green spaces, it has given a good general indication, however more in-depth analysis of pH influencing factors and a wider survey area with more point references would give a broader picture, (for example soil pH graduation changes on one site and whether or not this influenced the type of land management in the area).

6.2 Recommendations

There are some major groups of plants which require more specific pHs: most heather's, azaleas and rhododendrons, for example, need an acid soil. Most flowers however thrive in soils of pH in the range of 6.0-7.5, although the optimum is around 6.5. Roses, lupins and lilies, for example are said to prefer slightly acid soil. The acidity of the soil also effects its fertility and earthworm population: worms dislike a very acid soil, the acidity can be reduced by adding lime (detailed instructions are given in pH testing kits), calcified seaweed is also effective for reducing acidity and has additional benefits for the soil. It is not easy to make an alkaline soil more acid:

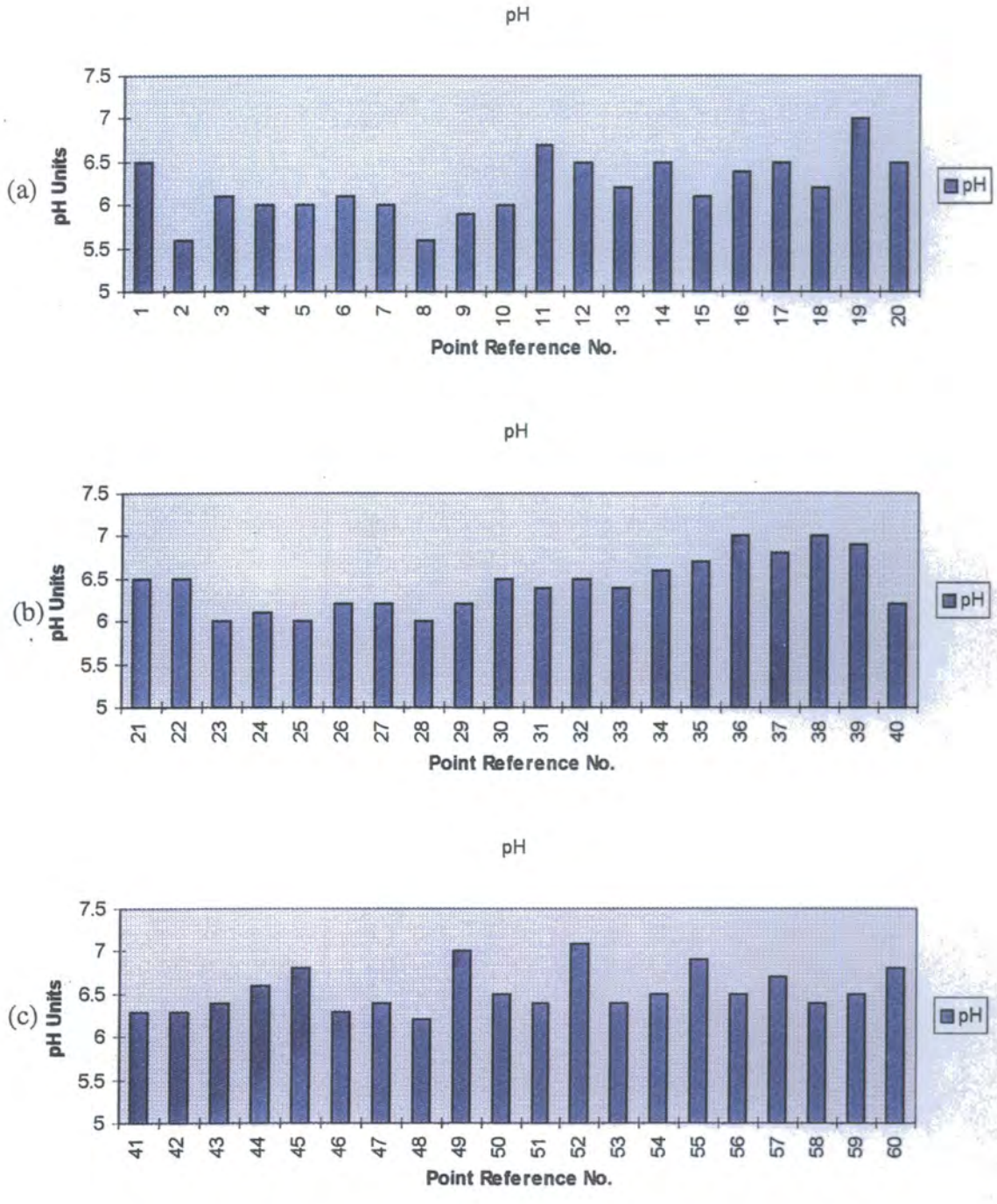


Fig. 6.1 Graphs of pH values recorded at point references in Durham City (**see Appendix 15b**) for values and point reference locations)

(a) pH values at point references 1- 20.

(b) pH values at point references 21- 40.

(c) pH values at point references 41- 60.

the best method is the continual addition of organic matter-particularly peat-over successive seasons.

6.3 Decreasing soil acidity

The amount of lime needed to counteract acidity depends on the pH of the soil and the form in which it is applied. As a guide (**Figure 6.2**) the following amounts of lime will reduce acidity by about 1.0 pH:-

Soil	Hydrated lime	Ground limestone
clay	425g/sq m	575g/sq m
Loam	285g/sq m	380g/sq m
Sand	140g/sq m	190g/sq m

Fig. 6.2 Amounts of lime needed to reduce acidity by 1.0 pH.

The following recommendations suggest how to bring a high acid soil to an acceptable pH for plants to grow:-

- Apply only sufficient lime to bring the pH to 6.5.
- The pH figure should only be taken as a guide. On dry soils (especially when assessed by a probe) the reading may indicate that the soil is more acid than it really is. Conversely, readings taken in late winter can indicate too high alkalinity.
- Avoid excessive liming as it leads to deficiencies of iron and manganese.
- Apply lime after digging the soil in early winter, dusting it over the surface so that subsequent rain will wash it into the ground; surface lime damages plants.

7.0 EFFECTS OF LITTER AND FLYTIPPING ON GREEN SPACE IN DURHAM CITY

This section looks at the problem of litter and flytipping on green site in cities and ways to reduce it:-

Throughout the course of the investigation on green sites in Durham City, mention has been made of rubbish in general and flytipping in particular on:-

- The value of these sites both physically (damaging to wildlife, the environment and humans).
- and aesthetically (spoiling the look of the site).

One of the biggest problems and management challenges facing green spaces in cities, is litter and its more harmful counterpart, flytipping. Grassed areas are particularly vulnerable to flytipping if they are flat and concealed, if there is a relaxed air of maintenance and if they are easily accessible to vehicles. Whilst litter is dispersed by frequent mowing and hidden by the fresh growth of grass, there is a tendency for debris to accumulate in unmown swards, unless special corrective measures are taken. In areas where public cleansing operations are already over-stretched or ineffective it may not only be expensive but impossible to cleanse areas of long grass. The 'natural' herbaceous vegetation can then become extremely unsightly. The effect of reduced mowing may also therefore be to transfer costs from the grounds maintenance department to a cleansing department causing friction within the overall organisation. Fly tipping can be an expensive problem, particularly in urban areas: it can really only be solved at source. This involves preventing access, as well as improving both public attitudes and behaviour. Whilst the former is usually expensive, the latter usually requires a sustained campaign over several years.

7.1 Recommendations

The disposal of rubbish on to urban green sites occurs almost entirely at the margins so can be solved by appropriate edge treatments. Sometimes the standard edge treatment is usually a bank of rubble, about 1 metre high.This looks untidy and encourages tipping, while the alternative of a ditch is an even greater invitation for rubbish disposal. A better alternative is a timber rail-fence or a split chestnut paling supported on frequent posts, both can be erected by volunteers. Another alternative now adopted by some councils is to topsoil, a 3 metre wide strip around the edge of the site, sow this with ryegrass, then mow it five or six times a year. This gives the site a well-cared for appearance, ties it in to the local surroundings and almost eliminates fly tipping, at the same time any informal paths that have developed across the site are surfaced with a loose material, such as shale -which plants can grow in so that the width of the path adapts to the use it receives. Encouraging people on to sites like this helps with acceptability and promotes self-policing.

7.2 Litter assessment on green spaces - Recommendations : Bins

7.3 Emptying

The need for emptying depends on the size of bin and the level of use. Emptying may be daily in busy shopping areas, weekly in urban parks (**Figure 7.1**), fortnightly or less in rural car parks.

It is usually best combined with a normal cleansing or maintenance routine.

Speed of emptying depends on the design of the container as well as on the volume to be removed.Unlined bins appear to be easier to manage than lined ones. 'Loose' linings are liable to be stolen or damaged. If they are locked in to place, locking and

unlocking is a time-consuming process and operatives are likely to leave the linings locked in and to empty them by hand, so by-passing the original purpose of the lining.

Fig. 7.1 Bins in public parks, must be functional but made of rigid construction and blend in with the surroundings (Wharton Park 1997)

7.4 Maintenance

Galvanised steel is probably the most maintenance-free and damage-proof material for litter bins. It is resistant to most forms of vandalism as well as accidental or deliberate fires. Wood needs maintenance, and wooden bins usually need to be very sturdily built. Less robust designs, such as those with slatted sides, are very liable to damage. The capacity must be appropriate both to the frequency of use and emptying.

8.0 GRANTS FOR GREEN SPACE AND THE ENVIRONMENT

8.1 Introduction

Green space projects in cities requiring financial help, can apply for grants, some specifically for this purpose, the following are a few which fund these projects:

8.2 Woodland Grant Scheme

Various grant schemes have been available over the years, but these are now consolidated into the Woodland Grant Scheme (WGS), which offers a sliding scale of payments depending on the species and type of ground planted. The Forestry Commission (FC) requires to be assured that schemes are satisfactory in their design and implementation, and will normally pay grant on a phased basis as the plantation becomes established. In 1991 a scheme of 'extended payments' was introduced so that foresters received continued subsidy for sound management during the lifetime of trees. When tax relief was removed in 1988, grant aid was considerably increased by way of compensation and this of course, benefited all potential investors rather than those with high tax liabilities. It is however likely that some sensitive form of tax concession will be reduced to offset the inevitable decline in private planting which occurred post-1988.Grant aid is only awarded after consultations which may be necessary (whereas tax relief is automatic). Consultees include the Ministry of Agriculture Fisheries and Food (MAFF), the nature conservation agencies over Sites of Special Scientific Interest (S.S.S.I.'s), the landscape conservation agencies (over designated areas) and local planning, (including National Park Authorities), (over sensitive areas or large schemes). Occasionally, other interests such as the Red Deer

Commission may be involved. Prior to the abolition of tax relief (which was not subject to consultation or clearance), there was an agreement not to proceed where grant aid has been refused following objections by consultees. On a small number of occasions this was flouted, and was a contributory factor to the demise of tax relief.

8.3 Farming and grant aid

The following sections look at ways in which agricultural land can be converted into woodland and other green space with the help of various grants specifically for this purpose:-.

A plethora of measures now exists to help in the 'greening' of agriculture and the diversification of the rural economy, many of them deriving from the government's *alternative land uses and the rural economy* (ALURE) initiative of 1987. Most of these fall into the 'sector-specific' category, but increasingly they are driven by concerns for the broader rural economy and environment. Thus, support is being channelled directly to the farmer to help sustain traditional rural lifestyles and landscapes. A summary of the main measures is given, below but to these should be added the various amenity grants available from nature and landscape conservation agencies, local authorities and certain voluntary organisations, as well as the mainstream agriculture and forestry grants. One caveat should be borne in mind, however. Historically, there has been a tendency to assume that farm improvement was largely a grant-driven process, but more recently it has become clear that availability of grant aid has only been one factor, along with price support, research, education and attitudes. It is thus difficult to change the ways in which farmers perceive and manage woodland and other habitats on their farms simply by providing new grants, especially when those grants do not cover full costs (Selman 1992)

8.4 Farm diversification grant scheme

As a result of section 22 of the 1986 Agriculture Act, an annual budget was introduced to support farm diversification and the marketing of new products.The scheme is intended to aid farmers to venture into certain profit-making non-agricultural activities and does not offer assistance to enterprises dealing with alternative crops or livestock, nor the production and marketing of any other primary commodity.The FDGS has now been merged into the Farm and Conservation Grant Scheme regulations (Selman 1992).

8.5 Farm woodland scheme

In April the FWS was introduced with the intention of encouraging farmers to convert land currently under agriculture to woodland. In the first experimental three-year period the main purpose was to plant 36,000 ha of arable or improved grassland with trees. Under this scheme the minimum amount of land which can be planted per holding is 3 ha (1 ha in Northern Ireland) and the maximum 40 ha. The scheme is only open to those landowners or tenants for whom the land to be planted forms part of their agricultural business (Selman 1992).

8.6 Set aside schemes

This scheme was introduced in August 1988. It is a voluntary scheme whereby farmers receive payments for setting aside at least 20 per cent of their land currently in use for various surplus crops. Any form of agricultural production is prohibited on set-aside land, which means that farmers may not graze farm livestock for produce fodder crops either for sale or for use on the farm (other than for horses. However, land and

buildings may be used for a variety of non-agricultural activities such as tourist facilities, caravan and camping sites, car parks, game and nature reserves. Land under this scheme may also be used for woodland. A countryside Premium is payable in selected counties through the Countryside Commission as a top-up for farmers agreeing to enhance the amenity aspects of set-aside land (Selman 1992).

8.7 Countryside stewardship scheme

This is a scheme providing initial capital grants plus annual payments to manage important landscapes and ecosystems such as chalk and limestone grasslands, lowland heaths, river valleys and coastal areas. About 80,000 ha are expected to be covered by the scheme by the end of 1994, of its first three years of operation, with payments averaging around £100/ha. Participating farmers will have to agree to let the public walk on their land, and management methods will have to conserve and enhance features of interest (Selman 1992).

8.8 Rural Action for the Environment

Rural Action is a partnership of organisations working for a better environment. It has a national office, but grants and advice are administered locally. It is funded by the Countryside Commission, English Nature and the Rural Development Commission. Rural action can provide practical advice and finance for improvements to many local environmental projects and can also help with the implementation and maintenance of such schemes.

Projects include:-

- Landscaping a public area.
- Energy saving study.

- Pond restoration.
- Wildlife survey.
- Village trail.
- Parish map.
- Woodland management plan.
- Environment evening class.
- Village appraisal.
- Nature trail.
- Traffic survey.
- Guided walks.

Grants are available of up to £2000 and cover up to half the cost of the project, including any specialist advice, technical services or training needed (**see Appendix 16**).

Rural action has helped projects in County Durham:-

- Young people at Fishburn had Groundwork Trust advice when planning landscape tree planting on a colliery pit heap.

8.9 National Lotteries charities Board

The National Lottery Charities Board can make grants to charitable, benevolent or philanthropic organisations. This means grants can be made to not only charities but also to many other types of voluntary or community organisations. For an organisation to be a charity it must exist for purposes which the law regards as *exclusively* charitable. Broadly, charities must be for the benefit of the public and charitable purposes fall into a suitable category i.e:-

- The protection of the environment and the preservation of endangered species.

Ineligible organisations include those which are not charitable, benevolent or philanthropic organisations. Including:-

- Local authorities, including institutions or services directly managed by them, local education authorities (LEAs), including services or schools directly managed by them.
- Parish Councils

8.10 English Nature (EN)

English Nature (formerly the Nature Conservancy Council), is the government funded body set up by the Environmental Protection Act 1990. It promotes the conservation of England's wildlife and natural features for the present generation and the next generation.

The Rio Earth Summit in 1991 generated two global initiatives to which nature conservation must contribute. The Biodiversity Convention has generated the Biodiversity Action Plan which contains an urban section. Agenda 21.This initiative emphasises the importance of local partnerships and local action over a wide range of environmental problems and sustainable development. Grants are offered to organisations and individuals to help achieve this. In addition the Local Projects Fund, managed by the Civic Trust makes grants of up to £10,000 to urban projects which demonstrate clear environmental advantage and involve, benefit and provide access to the local community.

Grants are available for:-

- New projects enabling the safeguarding, management and enhancement of

sites and species of nature conservation importance and their enjoyment by the public.

- Projects enabling local communities to participate more fully in nature conservation programmes.
- Proposals designed to encourage the development of management for wildlife within Natural Areas of the countryside.
- Innovative projects demonstrating new initiatives which are likely to have a wider relevance and further the practice of nature conservation with other interests and potentially competing activities.

9.0 FUTURE DEVELOPMENT IN DURHAM CITY AND ITS EFFECTS ON GREEN SPACE

Due to sensitivity of the World heritage site, any development which is likely to have an adverse effect on its setting may require Environmental Assessment. In particular the environmental capacity of Durham City is largely determined by the need to protect the historic character and the setting of the town. In the case of Durham City therefore, particular regard must be given to policy 10.

Policy 10:-

> *In Durham City new development will take the form of redevelopment, infilling or consolidation of the existing built up area. No new major releases will be allowed which would extend the built-up area into the surrounding countryside which would damage its unique character and setting*
>
> (County Durham Structure & Durham City Local Plan,1995).

New developments include the Howlands farm University development and the Prince Bishops Centre for life time learning, part of the Millennium City project, (Grid Ref NZ 276426). The centre is being built on the site of the Cathedral carpark (**Figure 9.1**).

New development is also on going with Mountjoy and the science park.

9.1 Howlands Farm (Grid Ref NZ 272406)

Howlands-phase 1 graduate centre. Sept 1998, building Oct 1999.

This new development of a residential college on the Howlands farm site has been in response to the Government's policy on Higher Education and the need to increase its resource base, the University is in the process of increasing it's student numbers from 6,746 at present to over 8,500 in the next few years.

Fig. 9.1 Construction for the Millennium Project beginning on the site of the Cathedral car park (1997)

The University, with guidance from the City of Durham Council, Directorate of Technical Services, first reviewed suitable sites for the proposed development.This search included a review of the existing University assets by Sanderson Townend and Gilbert in 1992 and identification of green field and redevelopment options.

The area of the site designated for the new college is intended to minimise the visibility of any built development from the A177 and so limit its impact on the wider A.G.L.V The City Council considered it important that development, including car

parking areas, should avoid prominent ground positions. Furthermore, the impact of the college on the countryside needs to be handled with due sensitivity to the interests of public amenity and wildlife.Consequently, the principles set out in the Environmental Statement are being carried forward into the detailed layout and design.These will inevitably impose constraints on the range of solutions which are likely to be acceptable to the Local Planning Authority. Extensive landscaping will enhance the character of the existing site, the neighbouring woodland and botanic Garden.Ove Arup Associates who won the contract aim to create "a stunning permanent, sheltering and secure landscape".

9.2 Mount Joy and Science Park (Grid Ref NZ 277412)

The £30m construction of the Science Park at Mount Joy, (NZ 277412) is still continuing after the first building has been completed. The site is set within mature woodlands and will be the new headquarters of the Northern and Yorkshire Regional office of the National Health Service Executive. Also included in the plans will be a wild life-meadowland green corridor and natural lake.

9.3 Durham City-The Millennium Project

The main direction of the project is community based and it will bring 750 jobs to the city. Environmental issues are also central to the plan, with major improvements to the river banks and extended green spaces.

The main features of the millennium project are:-

- Millennium hall-incorporating a visitor centre, 500 seat multi-purpose auditorium and conference exhibition and educational facilities.
- Millennium Square- linking the development with the market place.

- A series of pedestrian piazzas and paths leading down to the river.
- Centre for life long learning, incorporating a new library.
- Community resource centre for community and voluntary groups.
- Riverside park and walkways with emphasis on leisure and recreation.

The plan is co-funded by the City Council and English Partnerships.

Already Boots Development has begun work on the shopping quarter. Completion of this scheme will trigger construction work on the Millennium projects linked with the Millennium scheme's main features with completion in the year 2000. Work on some independent projects linked with the millennium scheme, including improvements on the riverbanks will begin sooner (Durham City Council,1998).

10.0 EXECUTIVE SUMMARY- GREEN SPACE IN CITIES AND THEIR APPROPRIATE FUTURE MANAGEMENT

10.1 Introduction

In order to gain maximum benefit from the green sites in a city, it is necessary to know how people use their environment and what they want from it. For example social scientists and environmental psychologists are now beginning to discover what form the often quoted 'popular demand for nature in cities' takes and just how difficult it is to provide for.Work to date has shown that aspirations differ greatly according to income group, age sex and cultural background, with women. Ethnic minorities and low-income groups showing a particular reluctance to use areas of more informal landscape (Gilbert 1989). Work on Merseyside by (Fitzpatrick 1984) has given a glimpse of how this might be overcome with the discovery that the use public open space has correlates strongly with the level of management the vegetation is given; length of surfaced footpath and number of access points also play positive, but less important roles.The middle classes appear to appreciate aesthetic aspects of public open space more than the lower-income groups, who look on it mainly as a background for enjoying the company of others- a social rather than an environmental experience.Women on their own are apt to fear natural sites (they are often the sites where sexual attacks occur), though this applies less to those accompanied by a dog. Many people want natural sites close to their homes which they can experience on an everyday basis, green space in cities provide for this need, small areas are seen as best because large expanses can be threatening.The pleasures derived include colour, the unexpected event, contact with birds and animals, quietness, collecting and the

variety, as a bonus, social interaction appears to be enhanced by the informal countryside appearance.

10.2 Important Principles

Urban green spaces in cities come in many forms, cemeteries, parks, railway land, allotment gardens, school grounds and disused building sites overtaken by nature. Even though a wide range of habitats are seen as green spaces in cities, their importance has not been generally recognised until relatively recently.The study has discovered the following important principles for requirement of green spaces in cities:-

- Recreation - a cities residents require space, for general activities such as walking, exercising of dogs, reading playing sport and other outdoor pursuits.
- They are valuable for scientific research - especially in the case of relict areas of countryside encapsulated within the urban boundary or the plant communities of certain kinds of industrial waste.
- Their accessibility makes them important for education and or other kinds of community involvement, even (or perhaps especially) where scientific value is unexceptional.
- Ecological approaches to landscape design and land reclamation-whilst not appropriate everywhere, often result in greater establishment success and reduced maintenance costs.
- Flourishing urban wildlife to some extent compensates for the ravages

inflicted on the countryside, especially where quasi-agricultural management regimes can be adopted (e.g. hay meadow regimes on green urban space).

- Green spaces such as cemeteries, green corridors and railway land, often form linear tracts throughout a city and can provide interconnected wedges for the movement of wildlife and recreational activity (Groome 1990). Model planning guidance on the treatment of metropolitan green space in unitary development plans has been provided by the Countryside Commission (1987d) and the former Nature Conservancy Council, (1987).

- In areas of relic countryside and modern urban green space, a new type of green space evolves, known as the 'urban fringe' and typical only of towns and cities.
- Green spaces provide community involvement through working and preserving these sites. (For example St Oswalds Churchyard).

10.3 Analysing the data

In analysing current management regimes/techniques for each of the green spaces looked at in the study, background data was collected.This has been classified into 3 types (Fortlage 1990):-

- 'Hard data - management plans'.
- 'Intermediate data'- Vegetation species, landuse.
- 'Soft data - Interviews

From this information and by reviewing and assessing present management systems and techniques it was decided whether alterations/improvements to management of

green sites was necessary in terms of financial savings, such as (mowing the site less often or using environmentally sympathetic management/conservation methods), to changing the original use of sites, (abandoned allotments to wildlife areas). Many of the green spaces investigated, had existing management plans, but these were general Maintainance plans and specific Maintainance plans were set out in contract tender documents. Some sites were designated a no change of management policy, ('do nothing policy') either because of their restricted current use or management was adequate for the site's present use. To increase management efficiency or make other improvements to green sites, recommendations were made, for example fly-tipping clear-ups on Gilesgate Field or willow walls for reducing noise level effects on green spaces, or less mowing on a particular site, a case in point of this happened in the early 1970s when a directive was issued by the Ministry of Transport to cease the regular mowing of motorway verges. This primarily financial decision produced what are now highly valued tall grasslands.

It was found that many owners of sites had already taken on-board, sympathetic environmental land management policies to a greater or lesser degree, examples include, planting native trees - this practice is encouraged in Durham by the City and County Council and the University Of Durham. The Botanic Garden, is looking into ways at recycling garden refuse through green mulch recycling. St Oswalds churchyard in Durham is a very good example of how sympathetic management has encouraged human visitors and wildlife, winning a 'Britain in Bloom' award with its natural management approach, its pioneering management practices are now being tried on other churchyards in Durham, (e.g. St Margarets), using less herbicides on highly intensely used areas (e.g. Wharton Park and River Banks).

Green spaces in Durham and other cities can also benefit from Local Agenda 21

input. This advisory body in Durham is located in the County Council Environmental Planning Department at County Hall, and is concerned with environmental sustainable development projects. These projects are sometimes carried out inconjunction with the Durham Wildlife Trust, examples of recent projects include, local Agenda 21 school pond dipping survey (1996) and red squirrel survey in Hollinside Wood (1997).

The age, natural history and historic value of many of the sites investigated means that they are generally safe from development. The current Local Plan proposes that the area covered by the World Heritage designation, be enlarged to include the peninsula, the river and its banks, this designation will cover many of the green spaces in this study.

With the advent of the Millennium Project for the city, more emphasis will be placed on creating and maintaining new green space, such as the 'Millennium parks and greens'.

Given that sites may have both genuine scientific importance and be attractive to visitors, a balance needs to be struck between conservation and public use. Ideally they should also be accessible, safe, disused and free from tenure restrictions. Emery (1986) has noted that urban green space may have many potential uses including nature trails or reserves, urban farms, community gardens, managed ecological parks or unmanaged wilderness areas, various types of woodland, and corner landscape features. Provided the management considerations are not too complex, it may frequently be desirable to devolve the control of urban green space to local communities, (e.g. St Oswalds churchyard), its potential benefits include an increased sense of commitment by people to their local area, reduced costs and liabilities to the local authority and a reduction in the vandalism associated with objects of

'officialdom'. Sites are inevitably prey to a variety of adverse pressures (Morgan 1986), including fires and barbecues, dog nuisance, egg stealing, flytipping and litter, shooting and trail biking and illicit practices such as glue sniffing. Involvement of local communities in the selection and execution of projects and/ or subsequent site maintenance, may offer a solution. Frequently expressed points of dissatisfaction which have been communicated to green space managers in Durham varied greatly ranging from too overgrown, untidy, messy, not safe on your own and dangerous -a wide range of feelings expressed during group discussions about a wood in London showed that an appreciation of the naturalness and variety of a wood was tempered by images of fear and danger, expressed more so at night (Gilbert 1989).

Green space establishment according to ecological principles entails careful selection of native plant species suited to site conditions and local to the area and planting strategies which seek to mimic the community composition and structure of natural climax or seral stages. Early attempts to achieve this often involved virtual abandonment to nature and this tended to attract public opposition, as the main colonisers were ruderal plants usually thought of as weeds. Continued experimentation with such approaches in the Netherlands and Sweden produced a distinctive school of landscape design, which has been successfully adopted by a few British local authorities (Gilbert 1989). A useful design principle for urban green space planning is to consider the eventual after-use of sites. Corder & Brooker (1981,1986) noted that human activity patterns tend to be concentrated into nodes and/or movement channels related to specific features, with a marked fall off away from these centres. A zoned system could provide for a traditional (high maintenance) approach centred on main pathways, gradually modifying to a more naturalistic approach centred in peripheral, low use areas.

10.4 The future

Environmentally sound behaviour in green space management must to a large extent rely on long-term attitudinal change of the grounds staff as well as specific practical reforms. Positive attitudes can be initiated by early commitments and manifestos from enlightened Council's, the result of this is environmentally sensitive management planning and frequent monitoring and review of green space in cities in the form of comprehensive Environmental Audits and SoE Reports.This is now gradually becoming the norm rather than the exception.

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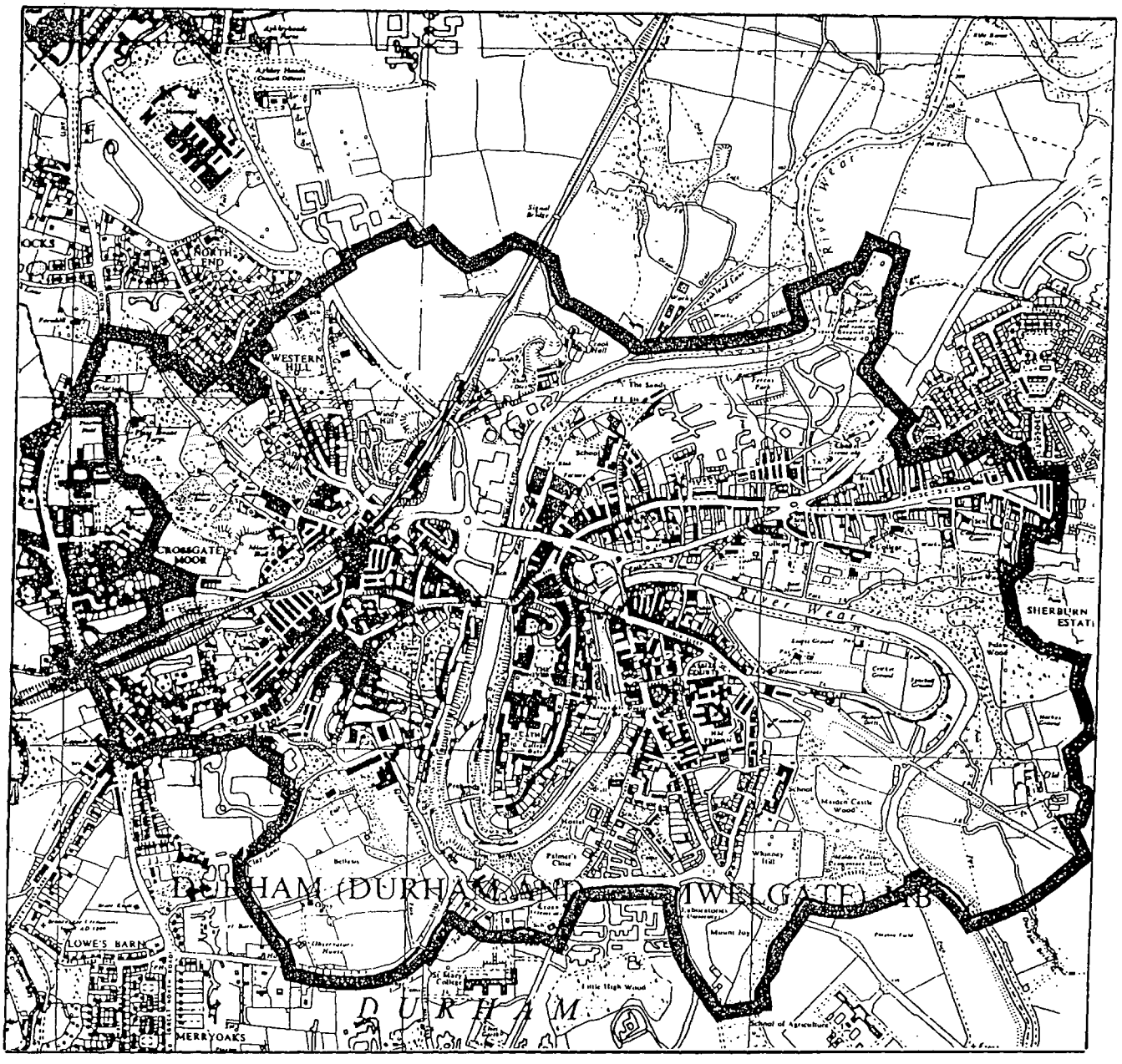
APPENDIX 1



DURHAM

(City Centre)

CONSERVATION AREA

DESIGNATED 25th November, 1980
(Core Area designated 9th August, 1968

DESCRIPTION

The central area of the City of Durham is one of the principle historic towns in Britain.

Its Cathedral has been acclaimed as one of the greatest achievements of the Romanesque style in Europe. Together with the Castle, the Cathedral stands high on a peninsula formed by a loop in the River Wear and set within a natural bowl containing the pre 1900 built up area of the town. The Conservation Area encompasses most of this 'bowl' area and incorporates important green wedges of countryside and other open areas.

LISTED BUILDINGS

Grade I	17
II*	373
II	21
III	32
A	2
B	4
TOTAL	449

ANCIENT MONUMENTS 11

CITY OF DURHAM
CITY PLANNING OFFICE, Byland Lo
Hawthorn Terrace DURHAM DH1 4
Telephone Durham 67131

Green Belt Compromise

by LUCY BARNARD

DURHAM County Council has succumbed to pressure from the 'Durham in Danger Campaign' and is proposing the imposition of a Green Belt encircling the City and linking up (through Chester-le-Street District) with the Tyne and Wear Green Belt.

Prior to this announcement the County Council had proposed a far smaller Green Belt described by the Campaign as "Piecemeal and fragmented". However, in a public hearing at County Hall in September 1996 the Campaign argued for a Green Belt encompassing the City. Consequently, an Independent Panel proposed a new plan for larger Green Belt.

These modifications have been welcomed by the Campaign, although its members are still adamant that further Green Belt is needed around the City. "The Campaign has made great strides towards achieving its aims," remarked Frank Orr, Secretary of the Campaign, "In the three years of the Campaign the County Council has moved from downgrading landscape protection to an encircling Green Belt linking up with the Tyne and Wear Green Belt."

Nonetheless, the "Durham in Danger Campaign" is still demanding an altered plan covering the area north of Consett and Stanley and eastwards to Chester-le-Street. A further area would extend southwards from Chester-le-Street, east of Kimblesworth, south of Witton Gilbert and southwards to Croxdale and then north-eastwards to Sherburn and West Rainton.

Durham University is one of the main objectors to the Green Belt as the scheme would be a stop to possible further University expansion such as the new college at present being built near to Collingwood. However, environmentally aware students have been active in this campaign for a number of years and Mr Orr has offered to come and talk to colleges about the issues.

In order to continue their drive, the 'Durham In Danger' Campaign are holding a public meeting in Durham Town Hall at 7.30 on Thursday 29th January in which they will discuss these proposals. They are urging Durham residents to write to their County Council emphasising their support for the campaign. Students are told that they will be especially welcome.

DURHAM CITY COUNCIL
AMENITIES & LEISURE

Beautiful Durham 1997

This competition is all about stimulating interests in our environment and improving the overall appearance of the Durham City District, for all those who live and work here and , those who come to visit our city.

There are numerous categories in the competition, offering everyone the opportunity to take part, either as an individual or, as part of a community effort. There are excellent prizes on offer too for the winners in each category, although everyone who participates will be a winner by helping to improve our city. Remember too, that you will be making a contribution to the overall efforts of the city in the 'Britain in Bloom' competition.

There is no entry fee for any of the competition categories, just complete and return the application form by **Friday 4th July 1997** and, you will be placed on the Judges' list. Pre-judging will take place on Monday 14th July; selected entries will then go forward for the final judging on Thursday 24th July.
All Awards will be presented at a special ceremony on Thursday 18th September, at the Town Hall starting at 7.30 p.m.

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Beautiful Durham

APPENDIX 4

Big issue April 6-12th 1998 PG 14-15

Fifty allotment owners are up in arms about developers wishing to build on their allotments. They are using direct action as active Eco-protesters, willing to dig tunnels/tree climbing techniques to defend their land. This is happening at St Stephen's, near Bath. Bulldozers are being blocked that are trying to develop the land. The residents and Vic Finlayson, who is leading them have spent 3 years defending off the developer, Beaufort Homes, from concreting over St Stephen's allotments, other action involves burning eviction notices. The owners of the allotments are annoyed that the church of England is selling off the allotments to Beaufort Homes.

Allotment holders are being uprooted at an alarming rate as the scrabble for prime, suburban land required for new housing intensifies. More than 10,000 plots, sold to the developers by landowners, like Railtrack and the Church of England, have disappeared each year since the late seventies. In 1978, there were around half a million plots. Today there are just over 300,000.

A parliamentary cross-party inquiry into the matter was set up last month following a year long campaign by Allotments 2000, headed by *Amateur Gardening* magazine. The select committee will decide whether tougher legislation is needed to protect allotments from developers.

"Allotment holders tend not to be the sort of people you would expect to be part of the protest movement. They just want a piece of land where they can grow lemons and spuds for the family," says National Society For Allotment Holders And Leisure Gardeners spokesman Geoff Stokes.

"In the past they have tended to accept legislation because there is nothing they can do about it. But the current situation has prompted many holders to dabble in direct confrontation to defend these green spaces.

Increasingly as well the younger generation are eager to have spaces of their own. Renting an allotment has become fashionable in big cities as an alternative to having a garden.

Jo Harding 27, has been at her allotment by Putney Bridge in South-west London for one and a half years. "I think growing your own veggies is catching on", she says. "I like having the feeling of earth under my fingernails, it's very therapeutic and a lot tastier and cheaper than the shops.

"It is nice to be outside gardening, surrounded by greenery when you are in the city. I get a feeling of well-being and so does everyone else on the allotments. No one will take this away from me.

North of the border where the situation is worse, allotments holders are defending their plots against property developer Caledonian Homes, which is keen to build on 59 plots in the Craigentinny district of Edinburgh, where there is a two-year waiting list for allotments. Caledonian bulldozed a JCB through the site in January, destroying scores of fences and plots. In retaliation gardeners removed padlocks and are continuing to flout an eviction notice issued in November.

"We will support any form of direct action to highlight the plight of allotment users", says Ian Goodbrand of Edinburgh Community Organic Gardens which campaigns to preserve plots in the city. "We are prepared to prevent the bulldozers by tunnelling and tree climbing. A lot of the older generation of allotment holders were intimidated by local councils and developers. But the new generation will not put up with this". One allotment holder says his quality of life has "shot up" since renting his plot and has vowed to keep fighting to prevent the land from being developed.

Grass roots support

Government moves to save threatened allotment sites in North East from extinction

GREEN-FINGERED allotment owners on Tyneside welcomed a Government move today to save their beloved vegetable patches from extinction.

Official figures show the number of allotment sites has halved in the last 30 years and MPs are hoping to pass legislation to protect their shrinking numbers.

The report also reveals allotments are beginning to become more sought-after, with young families using them as an important source of leisure.

By DYLAN DRONFIELD

Ernie Brown, representative of Newcastle's Rectory Road allotments in Gosforth, welcomed the new proposals, but said he looked forward to seeing action rather than words.

"Allotments are for more than just growing vegetables – they are a source of recreation just like a sports centre."

The Rectory Road site was threatened with closure for a decade as Newcastle City Council planned to sell it for housing, but the owners fought back and managed to secure the plot's future earlier this year.

The report from the Commons environment, transport and regional affairs committee called on MPs to revise the laws on development to stop situations like this unfolding.

It also said the image of retired old men in flat hats being the main holders of allotments is fast changing, with a surprising large percentage of younger people starting to use them.

Mr Brown said: "We have plots at Rectory Road with probably 150 people involved, including husbands and wives with young children as well as the grandparents."

The report called for the Government to act as soon as possible.

It said: "Allotment land is the principal category of urban green space which is being erod-ed."

ACTION NOT WORDS – Rectory Road allotments representative Ernie Brown

APPENDIX 6

From Environmental Post Dec 21 1997

Railtrack London North East zone (RtLNE) and environmental consultants ADAS have launched an innovative new management plan. The aim is to create sustainable woodland and shrub undergrowth that will reduce long term control costs, minimise the impact on the railways operation and provide a valuable environmental resource. Long term management plans will create a diversity of habitat, that is beneficial to wildlife. Such improvements will bring cost savings to the trackside vegetation management programme says Production manager David Knight. Railtrack and ADAS believe it is possible to create a more diverse habitat, with more established native woodland and shrub species which also create fewer problems for the rail operators. Instead of damp sycamore leaves on the trackside in November, there could be a riot of colour from native trees and shrubs providing a valuable food source of berries for birdlife and small mammals. According to ADAS environmental Principle consultant and RtLNE project manager, Martin Buckland, the plan will minimise the impact on trackside wildlife while creating an area of real wildlife benefit.

Much of the neglected trackside has become overgrown with pioneering species of sycamore, ash, and elder. Now they are growing bigger and there are problems of dropped leaves and possible danger from fallen or overhanging branches. From an environmental perspective they are also shading out the low level shrub growth, that provides a valuable habitat.

Planned management of these trees combined with extensive planting and regeneration of native tree species and berry bearing shrubs, will provide a valuable wildlife corridor running across the countryside. The prolonged leaf fall of dry and dead leaves from native trees such as oak, beech, hazel and field maple pose fewer problems to rail operators than fleshy, succulent sycamore leaves. Ground cover shrubs and hedging act as a leaf trap in autumn, whilst providing a useful low-level sound barrier, creating a visually attractive area and providing a new and diverse habitat and food source.

Maintaining one of the country's busiest long distance routes RtLNE track maintenance engineer, David Joyce, says he has witnessed the state of the lineside deteriorate over the past 30 years. The years of neglect are now causing serious problems for both railtrack and its customers.

Lost revenue can come from:

1. Files incurred for failing to meet timetable, causing passenger dis-satisfaction

Safety of passengers:

2. Restricted vision, caused by unchecked tree growth, results in safe operation of automatic signalling equipment compromised.

RtLNE solution has been to commission a comprehensive study of its 5760 km of trackside by ADAS. A mapped report on around a third of the zone, broken down into readily managed quarter of a kilometre sections has already been produced. The assessment provides a risk category, from one to five, based on the leaf supply according to tree type and number combined, with the likely leaf fall and distribution.

APPENDIX 7

Newton Hall Junction: site description:

Site: Newton Hall Junction	Site number: 4.22	District: Durham
Grid reference: NZ 285 452	Area: Six hectares	O.S. Map: NZ 24 NE
Owner: Durham County Council.	Habitats: Marsh, acid and neutral grassland, scrub	Aspect: Open
Slope: Some small banks	Geology: Coal measures	Soil:
Land use:	Altitude: 60 metres	Adjacent land: Arable
Date: May 1991		Surveyor: V. Standen

Description of ecological interest: Parts of the dry embankment support acid grassland with heather (*Calluna vulgaris*), birch/oak scrub, occasional ash trees (*Fraxinus excelsior*), and herb-rich grassland with developing oak/hawthorn scrub. Wetter areas in the hollows between the embankments now contain wet, herb-rich grassland and marshy areas with sharp-flowered rush (*Juncus acutiflorus*), northern marsh-orchid (*Dactylorhiza purpurella*) and cuckoo flower (*Cardamine pratensis*). There are also small areas of standing water with bullrush (*Typha latifolia*), yellow iris (*Iris pseudacorus*), marsh horsetail (*Equisetum palustre*), broad-leaved pondweed (*Potamogeton natans*) and willow (*Salix sp.*)

Other comments: The site has considerable potential as a local conservation site as it supports a variety of habitats within a very small area. Yellow Corydalis (*Corydalis lutea*) is on the Sunderland museum data base as being found at Low Newton Farm, grid reference NZ283 456. This is described in the Durham Flora as uncommon (Graham 1988)

Turdus philomels	Song Thrush
Turdus iliacus	Redwing
Turdus viscivorus	Mistle Thrush
Locustella naevia	Grasshopper Warbler
Acrocephalus schoenobaenus	Sedge Warbler
Sylvia atricapilla	Blackcap
Sylvia communis	Whitethroat
Phylloscopus trochilus	Willow Warbler
Regulus regulus	Goldcrest
Aegithalos caudatus	Long-tailed Tit
Muscicapa hypoleuca	Pied Flycatcher
Parus ater	Coal Tit
Parus Caeruleus	Blue Tit
Parus major	Great Tit
Certhia familiaris	Tree Creeper
Pica pica	Magpie
Garrulus glandarius	Jay
Corvus monedula	Jackdaw
Corvus frugilegus	Rook
Corvus corone	Carrion Crow
Sturnus vulgaris	Starling
Passer domesticus	House Sparrow
Fringilla coelebs	Chaffinch
Chloris chloris	Greenfinch
Carduelis cannabina	Linnet
Carduelis flammea	Lesser Redpoll
Emberiza citrinella	Yellow Hammer
Emberiza schoeniclus	Reed Bunting

Additional species list for Newton Hall Junction

Flora	
Fragaria x ananassa	Garden Strawberry
Fragaria vesca	Wild Strawberry
Stellaria holostea	Greater Stitchwort
Ranunculus aquatilis	Common Water-crowfoot
Myosotis sp.	Forgetme not sp.
Calluna vulgaris	Ling
Lamium album	White Dead Nettle
Insects	
Gerris lacustris	Pond Skater
Bibio marci	St. Marks Fly
Artogeia napi	Green-veined White Butterfly
Anthocharis cardamines	Orange-tip Butterfly
Fish	
Gasterosteus aculeatus	Three-spined Stickleback
Amphibia	
Rana temporia	Common Frog
Triturus vulgaris	Smooth Newt
Birds	
Anas platyrhnchos	Mallard
Prunella modularis	Dunnock
Erithacus rubecula	Robin
Sylvis communis	Common Whitethroat
WillPhylloscopus trochilusow	Warbler
Parus caeruleus	Blut Tit

In addition the following plant is on the Sunderland Museum database as being found at Low Newton Farm (grid reference NZ283456):

Corydalis luteaYellow Corydalis

Graham (1988) described this in the Durham Flora as "uncommon".

APPENDIX 8

Fauna species list :

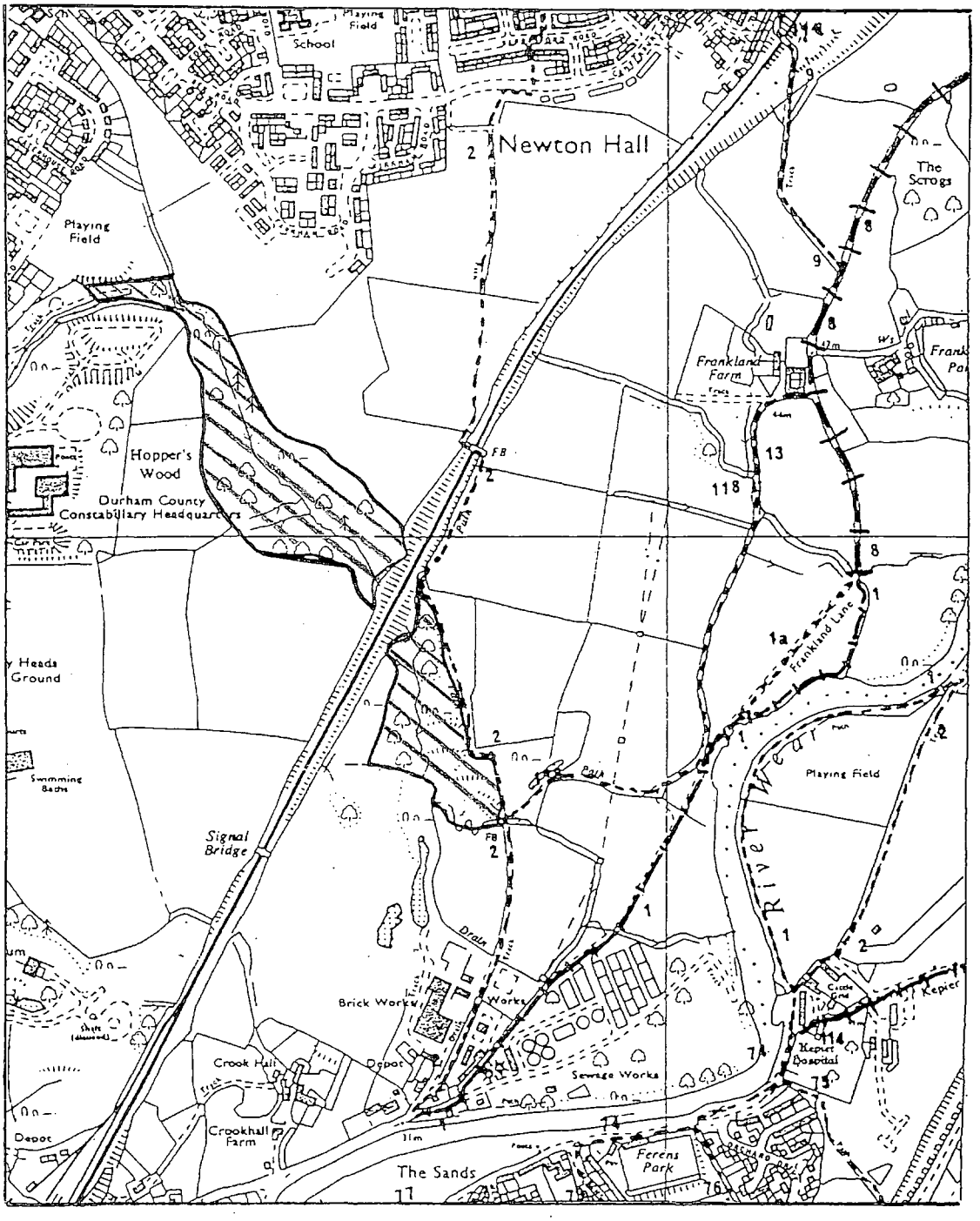
Common Name	Latin Name
Amphibians	
Common frog	*Rana temporia*
Smooth Newt	*Triturus vulgaris*
Mammals	
Red squirrel	*Sciurus vulgaris*
Wood Mouse	*Apodemus sylvatica*
Rabbit	*Oryctolagus cuniculus*
Birds	
Robin	*Erithacus rubecula*
Blue Tit	*Parus caeruleus*
Kestrel	*Falco tinnunculus*
Kingfisher	*Alcedo attis*
Blackbird	*Turdus merula*
Wren	*Troglodytes trglodytes*
Mistle Thrush	Turdus *viscivorus*
Pied Flycatcher	*Muscicapa hypoleuca*
Magpie	*Pica pica*
Starling	*Sturnus vulgaris*
House sparrow	*Passer domesticus*
Chaffinch	*Fringilla coelebs*
Jay	*Garrulus glandarius*
Insects	
Earwig	*Forficula auricularia*
Froghopper	*Cercopsis vulnerata*
Red Admiral Butterfly	*Vanessa atalanta*
Peacock Butterfly	*Inachis io*
7 spot Ladybird	*Coccinella 7-punctata*
Bees	*Bombus muscorum, Bombus terrestris*
Two-winged flies	*Chloria formosa, Stratiomys potamida*
Spiders	*Meta segmentata, Araneus umbriticus*

Flora species list :

Common Name	Latin Name
Sessile oak	*Quercus petraea*
Silver birch	*Betula pendula*
Common beech	*Fagus sylvatica*
English elm	*Ulmus procera*
Rowan	*Sorbus aucuparia*
Common alder	*Alnus glutinosa*
Sycamore	*Acer pseudoplatanus*
Common Hazel	*Corylus avellana*
Common ash	*Fraxinus excelsior*
Willow	*Salix* spp
Bramble	*Rubus* spp
Holly	*Ilex aquifolium*
Bracken	*Pteridium aquilinum*
Common nettle	*Urtica dioica*
Dock	*Rumex* spp
Ivy	*Hedra helix*
Hair grass	*Deschampsia flexuosa*
Broom	*Cytisus scoparius*
Honeysuckle	*Lonicera periclymenum*
Dog rose	*Rosa canina*
Greater stitchwort	*Stellaria holostea*
Red campion	*Silene dioica*
Ground ivy	*Glechoma hederacea*
Lesser celandine	*Ranunculus ficaria*
Mosses:	
	Hypnum cupressiforme
	Plagiothecium undulatum

Hopper's Wood
NZ275400

4.11



SITE NAME	Hopper's Wood	**SITE NUMBER**	4.11
DISTRICT	Durham	**GRID REFERENCE**	NZ 275440
AREA	6.5ha	**OS MAP NUMBER**	NZ 24 SE
OWNER	1) Durham County Council 2) Mr Leach Frankland Farm		

HABITAT(S) ...	Woodland	ASPECT	Valley
GEOLOGY	Coal Measures shale	SLOPE	Steep in places
SOIL	Brown earth	LAND USE	Recreation
ALTITUDE	70m	ADJACENT LAND USE..	Housing
DATE	May 1991	SURVEYOR	V. Standen

Description of Ecological Interest

Mature woodland on an ancient woodland site in the valley formed by a small tributary of the River Wear. The valley nearest the source of the stream is waterlogged and supports crack willow (Salix fragilis) and alder (Alnus glutinosa) with some bird cherry (Prunus padus) and elder (Sambucus nigra). The ground flora is dominated by common nettle (Urtica dioica), rosebay willowherb (Chamerion angustifolium) and cow parsley (Anthriscus sylvestris) and other tall herbs with small patches of reed canary-grass (Phalaris arundinacea) and tufted hair-grass (Deschampsia cespitosa). A small marshy area contains lesser celandine (Ranunculus ficaria) and marsh pennywort (Hydrocotyle vulgaris).

Lower down, the valley is steeper-sided and supports well developed deciduous woodland characteristic of acid soils which is probably partly natural and partly planted. Tree species include sessile oak (Quercus petraea), silver birch (Betula pendula), beech (Fagus sylvatica), sycamore (Acer pseudoplatanus) and occasional Scots Pine (Pinus sylvestris). The understorey is well developed in places with regenerating oak, birch and sycamore, and includes rowan (Sorbus aucuparia), holly (Ilex aquifolium), hazel (Corylus avellana) and honeysuckle (Lonicera periclymenum). The ground flora is abundant and varied with bluebell (Hyacinthoides non-scripta), wood-sorrel (Oxalis acetosella), red campion (Silene dioica), ramsons (Allium ursinum), male-fern (Dryopteris filix-mas) and other common woodland herbs.

The main railway line cuts through the wood which, to the south, contains considerable hawthorn scrub adjacent to Frankland Pond.

Other comments.

The woodland is ancient woodland and formerly part of Frankland Forest owned by the Bishops of Durham and for which there are records dating back to the 15th century.

12 Advertiser, week ending November 9, 1996

Green leaves point

By MEL MASON

INDICATORS have been devised to show whether County Durham is becoming a more or less environmentally-friendly place to live.

A new study into the health of the county has mapped out 25 ways people can measure changes to their environment.

The indicators show whether the county is becoming a better or worse place in which to live in the future. And they show there are big problems and challenges to be faced.

The survey has awarded green leaves to those areas of life where the county is heading in the right direction towards a sustainable future, and withered brown leaves where things are going wrong.

Environmentally the best performers are:

- Domestic use in energy, down 13 per cent.
- Roads so far as fatalities and serious injuries are concerned.
- Major rivers which are cleaner than 20 years ago.

the right way to go!

Less spectacular progress is also being made in areas of alternative energy production, unemployment, recycling, reducing nitrogen dioxide levels, keeping rights of way open and getting companies to improve environmental performance.

The biggest problems areas are identified as:

- Increased use of cars – travel to work trips rising 30 per cent in a decade.
- Filling of waste tips at a faster rate.
- Reduced use is recycled aggregates in construction.
- Loss of hedgerows – 46pc down since 1[illegible]

Concerns are also expressed over the provisi for disabled people, public transport, cycling a walking, butterfly and frog populations, a number of asthma cases.

Don Ross, chairman of the environme committee of Durham County Council whi commissioned the study, said there we worrying signs that the environment was not good health – locally and globally.

The county has launched a Local Agenda campaign which uses the indicators to measu future trends.

APPENDIX 10

Contains a rare species

SITE NAME	Pelaw Wood	**SITE NUMBER**	4.10
DISTRICT	Durham	**GRID REFERENCE**	NZ 285424
AREA	15ha	**OS MAP NUMBER**	NZ 24 SE
OWNER	Durham City Council		

HABITAT(S) ...	Woodland	ASPECT	South west facing
GEOLOGY	Coal Measures	SLOPE	Slopes steeply down to R. Wear
SOIL	Brown earth	LAND USE	Amenity woodland
ALTITUDE	70 - 75m	ADJACENT LAND USE..	Housing
DATE	April 1990	SURVEYOR	V. Standen

Description of Ecological Interest

An ancient woodland site now containing mixed deciduous woodland occupying the steep slopes of the valley alongside the River Wear in the heart of Durham City. The woodland is reasonably well structured although the shrub layer is not particularly well developed. Pedunculate oak (*Quercus robur*) is the most abundant tree but there is also a considerable amount of sycamore (*Acer pseudoplatanus*) and beech (*Fagus sylvatica*) present together with a small number of wych elm (*Ulmus glabra*). Shrubs include hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*) and holly (*Ilex aquifolium*). The ground flora is varied with dog's mercury (*Mercurialis perennis*), wood anemone (*Anemone nemorosa*), lesser celandine (*Ranunculus ficaria*) or ramsons (*Allium ursinum*) locally dominant.

The site is considered to be of ornithological importance.

Other comments

The wood is of particular interest in that it contains wood vetch (*Vicia sylvatica*) and wild liquorice (*Astragalus glycyphyllos*), both uncommon in County Durham. The wood is of great landscape value due to its proximity to Durham City. It is heavily used for recreation, particularly by children and somewhat degraded as result.

Operation Wildlife (£10.00,50p P+P)

This is a pack about creating a wildlife garden. It contains design and planting ideas with instructions, wildflower seed and how to sow it, wildflower catalogue and wildlife worksheets (it is primarily intended for outdoor use).

Key items:

A4 book, (wildlife garden design), 2 packets of wildflower seeds, booklet- 'The Wildlife Pond', coloured wildlife poster and badge.

The Wildlife Pond (£2.00)

Short booklet about creating a wildlife pond (note this item is included in the Operation Wildlife pack).

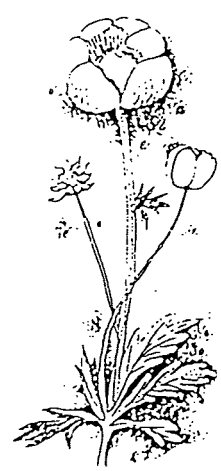
Wildflower plants/seeds

WILD PRODUCTIONS

WILDFLOWER PLANTS

WILDLIFE PUBLICATIONS

WILDFLOWER SEED



40 FARLANDS DRIVE
EAST DIDSBURY
MANCHESTER
M20 5GB

Tel. 0161 794 9314
Fax. 0161 794 8072

NPK LANDLIFE

SPRING/SUMMER 97

WILDFLOWER SEED

Code	WILDFLOWER SEED SAMPLER PACKS	Colour	Setting	Unit £
S1	CORNCOCKLE *(Agrostemma githago)*	Pink	Dry Sun	0.90
S2	CORNFLOWER *(Centaurea cyanus)*	Blue	Dry Sun	0.90
S3	CORN MARIGOLD *(Chrysanthemum segetum)*	Yellow	Dry Sun	0.90
S4	CORN POPPY *(Papaver rhoeas)*	Red	Dry Sun	0.90
S5	COWSLIP *(Primula veris)*	Cream	Sun	0.90
S6	EVENING PRIMROSE *(Oenothera biennis)*	Yellow	Shade	0.90
S7	FIELD SCABIOUS *(Knautia arvensis)*	Blue	Sun	0.90
S8	FOXGLOVE *(Digitalis purpurea)*	Purple	Shade	0.90
S9	LADY'S BEDSTRAW *(Galium verum)*	Yellow	Sun	0.90
S10	LESSER KNAPWEED or Hardheads *(Centaurea nigra)*	Purple	Shade	0.90
S11	MEADOWSWEET *(Filipendula ulmaria)*	Cream	Damp	0.90
S12	OX-EYE or Moon Daisy *(Leucanthemum vulgare)*	White	Sun	0.90
S13	NETTLE-LEAVED BELLFLOWER or Bats in the Belfry *(Campanula trachelium)*	Purple	Shade	0.90
S14	RED CAMPION *(Silene dioica)*	Pink	Shade	0.90
S15	TEASEL *(Dipsacus fullonum)*	Pink	Dry Sun	0.90
S16	All above come in fully illustrated packet with growing and maintenance instructions. ***SPECIAL WILDLIFE OFFER*** 1 of each of the above (S1 - S15)			13.50

	WILDFLOWER SEED MIXTURES		
S17	BLUE MIST (Corn Chamomile, Cornflower, Flax, White Campion, Wild Pansy)	Sun	2.75
S18	BUTTERFLY COLLECTION (Cornflower, Field Scabious, Greater Knapweed, Hardheads, Musk Mallow, Ox-eye Daisy, Yarrow)	Sun	2.75
S19	CORNFIELD COLLECTION (Corncockle, Cornflower, Corn Marigold, Field Poppy, Long-headed Poppy)	Sun	2.75
S20	COTTAGE GARDEN (Cornflower, Evening primrose, Foxglove, Lupin, Ox-eye Daisy, Teasel)	Sun	2.75
S21	All above come in a fully illustrated packet with growing and maintenance instructions. ***SPECIAL WILDLIFE OFFER*** 1 of each of the above (S17 - S20)		10.00

	WILDFLOWER SEED COLLECTIONS		
S22	PONDSIDE COMPANIONS Devil's-bit Scabious, Meadowsweet, Purple Loosestrife, Ragged Robin, Square-stemmed St Johns Wort, Water Avens, Yellow Flag	Damp	9.75
S23	WILD HERBACEOUS BORDER Betony, Common St Johns Wort, Dropwort, Field Scabious, Evening Primrose, Meadow Cranesbill, Musk Mallow	Sun	9.75
S24	SHADY CORNER Foxglove, Nettle-leaved Bellflower, Red Campion, Wood Avens, Hedge Woundwort, Lesser Knapweed, Welsh Poppy	Shade	9.75
S25	WILD HERBS Feverfew, Sweet Cicely, Tansy, Chicory, Wild Majoram, Wild Carrot, Salad Burnet	Sun	9.75
S26	WILDFLOWER MEADOW Betony, Cowslip, Lady's Bedstraw, Ox-eye Daisy, Quaking Grass, Self Heal, Yarrow	Sun	9.75
S27	ANNUAL SURPRISE Corncockle, Cornflower, Corn Marigold, Corn Poppy, Long-headed Poppy, Scentless Mayweed, Field Pansy	Sun	9.75
S28	MIDSUMMER GLORY Greater Knapweed, Musk Mallow, Small Scabious, Ox-eye Daisy, Meadowsweet, Agrimony	Sun	9.75
S29	BIENNIAL DELIGHT Dark Mullein, Evening Primrose, Foxglove, Greater Mullein, Teasel, Kidney Vetch, Alexanders	Sun	9.75
S30	Each Wildflower Seed Collection contains 1 gram of seed of each of the 7 different species. Also with design ideas, instruction sheets & wildlife challenges. ***SPECIAL WILDLIFE OFFER*** 1 of each of the collections (S22 - S29)		70.00

Carry forward Total S to main order form — **TOTAL S** £

All prices include V.A.T. and P&P - *All seed is of British provenance*

WILDFLOWER PLANTS

Code	WILDFLOWER SPECIES	Colour	Setting
P1	BETONY *(Betonica officinalis)*	Red	Sun
P2	BIRDSFOOT TREFOIL *(Lotus corniculatus)*	Yellow	Sun
P3	COWSLIP *(Primula veris)*	Cream	Sun
P4	DEVIL'S-BIT SCABIOUS *(Succisa pratensis)*	Mauve	Damp
P5	FIELD SCABIOUS *(Knautia arvensis)*	Blue	Sun
P6	GREATER KNAPWEED *(Centaurea scabiosa)*	Purple	Sun
P7	LADY'S BEDSTRAW *(Galium verum)*	Yellow	Sun
P8	LESSER KNAPWEED *(Centaurea nigra)*	Purple	Semi-shade
P9	MARSH MARIGOLD *(Caltha palustris)*	White	Damp
P10	MEADOW CRANESBILL *(Geranium pratensis)*	Blue	Sun
P11	MEADOWSWEET *(Filipendula ulmaria)*	Cream	Damp
P12	MUSK MALLOW *(Malva moschata)*	Mauve	Sun
P13	NETTLE-LEAVED BELLFLOWER *(Campanula trachelium)*	Purple	Shade
P14	OX-EYE DAISY *(Leucanthemum vulgare)*	White	Sun
P15	PRIMROSE *(Primula vulgaris)*	Yellow	Semi-shade
P16	PURPLE LOOSESTRIFE *(Lythrum salicaria)*	Purple	Damp
P17	RAGGED ROBIN *(Lychnis flos-cuculi)*	Pink	Damp
P18	RED CAMPION *(Silene dioica)*	Red	Shade
P19	SMALL SCABIOUS *(Scabiosa columbaria)*	Mauve	Sun
P20	WATER AVENS *(Geum rivale)*	Orange	Damp
P21	WHITE CAMPION *(Silene alba)*	White	Semi-shade
P22	WILD STRAWBERRY *(Fragaria vesca)*	White	Semi-shade
P23	SWEET VIOLET *(Viola odorata)*	Yellow	Shade
P24	YARROW *(Achillea millefolium)*	White	Sun
P25	YELLOW FLAG IRIS *(Iris pseudacorus)*	Yellow	Damp
	All plants have been container grown in peat-free compost (bar the Primulas grown in soil-based compost). None have been dug up from the wild. They are packaged after surplus soil has been removed. Each species is supplied in the following quantities:		
	5 of one species	£7.50	
	10 of one species	£12.50	
	100 of one species	£97.50	
P26	**WILD HERBACEOUS BORDER COLLECTION** 5 each of: Betony; Field Scabious; Lady's Bedstraw; Meadow Cranesbill; Ox-eye Daisy; Musk Mallow	£30.00 ea.	Sun
P27	**PONDSIDE FAVOURITES COLLECTION** 5 each of: Devil's-bit Scabious; Meadowsweet; Purple Loosestrife; Marsh Marigold ; Yellow Flag Iris	£30.00 ea.	Damp
P28	**SHADED GLADE COLLECTION** 5 each of: Lesser Knapweed; Nettle-leaved Bellflower; Red Campion; White Campion; Sweet Violet	£30.00 ea.	Shade
	WE DO NOT SELL WILDFLOWERS DUG UP FROM THE WILD		
	All prices include V.A.T. and Postage & Package We reserve the right to substitute species if necessary in the collections		
	If you require overnight delivery then please add	£12.50	

Carry forward Total P to main order form **TOTAL P**

PLANT ORDERS ARE SENT OUT FROM APRIL TO OCTOBER

WILDLIFE PUBLICATIONS

Code	PUBLICATION	Cost £
W1	**WILDLIFE M.O.T.** An assessment of how attractive your garden is to wildlife. We send you a questionnaire about your garden which you complete and return to us for our appraisal of your results. We then give you ideas how to benefit and attract even more wildlife to your garden. *Key Items*: Questionnaire; Our assessment; Wildlife recommendations	15.00
W2	**OPERATION WILDLIFE** This is a pack about creating a wildlife garden. It contains design and planting ideas with instructions, wildflower seed and how to sow it, wildflower catalogue, and wildlife worksheets. It is primarily intended for outdoor use. *Key Items*: Coloured A4 wildlife garden design; 2 Packets wildflower seed; Booklet 'The Wildlife Pond'; Coloured wildlife poster; Badge	10.00
W3	**WILD PUBLICATION PACK** This pack is based around a set of 6 leaflets about different wildflower garden themes (Scented, Shaded, Wild Herbaceous, Autumn, Spring, Wildlife). In addition there are wildlife challenge sheets, wildlife recording ideas, and seed. *Key Items*: 6 Leaflets; 2 Packets wildflower seed, Wildlife Challenges	4.50
W4	**'THE WILDLIFE POND'** This is a short booklet about creating a wildlife pond in your garden, perhaps the most important habitat of all for wildlife. (please note that this item is included in the Operation Wildlife Pack)	2.00
W5	**'THE WILDFLOWER COMPENDIUM'** A softback book detailing how to grow and maintain 200 species of British wildflowers in your garden. Each species is illustrated. There are also extensive lists of recommended native trees, shrubs, bulbs and wildflowers to grow in your garden.	6.50
	WILD POSTCARDS 2 sets of A5 'Jumbo' postcards are offered, each with 6 pairs of to-colour and pen & ink drawings (with 6 different wildlife designs). Each set comes with wildflower seed, wildlife challenges and colouring instructions. *Key Items*: 12 Jumbo postcards; Colouring instructions; 2 Packets wildflower seed; Wildlife challenges	
W6	SEASIDE FAVOURITES	3.50
W7	WOODLAND BIRDS	3.50
W8	*SPECIAL WILDLIFE OFFER* 1 of each of the above (W6 - W7)	6.00
	TREE MODEL PACKS 3-dimensional model trees to be made and placed on a special woodland habitat plan, all ideal for colouring. Each tree displays the four seasons on the same model. Full construction information is included with worksheets and wildflower seed. *Key Items*: Tree templates; Manual; Worksheets; Woodland base plan; 2 Packets wildflower seed	
W10	NATURAL WOODLAND	4.50
W11	URBAN WOODLAND	4.50
W12	HIGHLAND GLEN	4.50
W13	*SPECIAL WILDLIFE OFFER* 1 of each of the above (W10 - W12)	10.00
W14	**WILDLIFE GARDEN DESIGN PACK** A series of 5 different wild garden design themes (black & white) showing how a typical back garden can be transformed into various naturalistic habitats. Themes included are the wild herbaceous, wild wetland, wild meadow, wild woodland and Scottish gardens. In addition there is a list of suggested native trees, shrubs and wildflowers to plant in your garden, also wildflower seed and various instruction sheets. *Key Items*: 5 A3 designs; 2 Packets wildflower seed; Instruction sheets	4.50

Carry forward Total W to main order form — TOTAL W

All prices include V.A.T. (where applicable) and Postage & Package

For each sale of any of the above packs we make a donation to the charities Landlife & Cycling Project for the North West.

ORDER FORM - Please complete and return to

NPK LANDLIFE

NAME

ADDRESS

POSTCODE

TEL. FAX.

DATE ORDER NO.

Total W	£	Tick if you require VAT receipt
Total S	£	Tick if you require to be invoiced
Total P	£	Tick if you do NOT want to be on our mail list
TOTAL	£	Cheques made payable to NPK Landlife

NPK LANDLIFE

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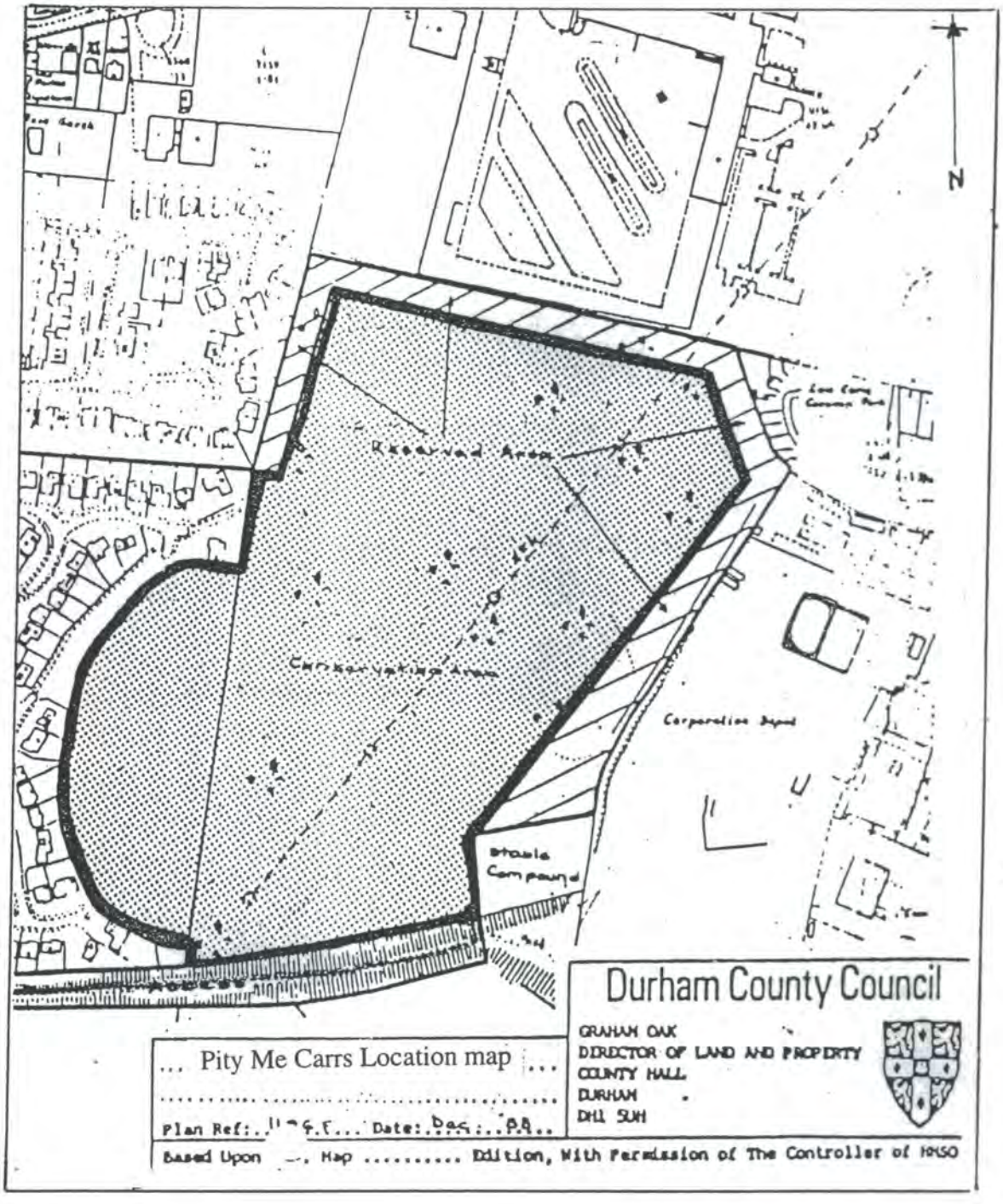


(5) FRAMWELLGATE MOOR CARR POND NZ 267454

Visited: 3rd October, 1983.

Land-owner: Durham County Council, County Hall, Durham, DH1 5UF.

Description: The pond, on Framwellgate Moor, is surrounded by rushes, and is grazed by ponies.

Pond Size: 40m x 14m.

Average/Maximum Depths: $\frac{1}{2}$m/1m.

Substrate: Mud.

pH: 5.7

% of Pond covered by Higher Plants: 35%

COMMON :Bedstraw
GENERIC :Galium saxitile

COMMON :Black Knapweed
GENERIC :Centauria nigra

COMMON :Blackberry
GENERIC :Rubus fruticosus

COMMON :Broad leafed dock
GENERIC :Rumex obtusifolius

COMMON :Chickweed
GENERIC :Cerastium spp

COMMON :Coltsfoot
GENERIC :Potentilla erecta

COMMON :Coltsfoot
GENERIC :Tussilago farfara

COMMON :Cotoneaster
GENERIC :Cotoneaster integerrimus

COMMON :Creeping buttercup
GENERIC :Ranunculus repens

COMMON :Dandylion
GENERIC :Taraxacum officianale

COMMON :Dead nettle
GENERIC :Lamium album

COMMON :Dock
GENERIC :Plantago media

COMMON :Dog rose
GENERIC :Rosa canina

COMMON :Fools parsley
GENERIC :Aethusa cynapium

COMMON :Foxglove
GENERIC :Digitalis purpurea

COMMON :Gorse
GENERIC :Ulex europaeus

COMMON :Great plantain
GENERIC :Plantago major

COMMON :Hawthorn
GENERIC :Crataegus monogyna

COMMON :Heather
GENERIC :Calluna vulgaris

COMMON :Heather
GENERIC :Erica cinarea

COMMON :Holly
GENERIC :Ilex aquifolium

COMMON :Marsh willowhe
GENERIC :E pallustre

COMMON :Moss
GENERIC :Polytrichum spp

COMMON :Moss
GENERIC :Sphagnum spp

COMMON :Mugwort
GENERIC :Artemisia vulgaris

COMMON :Red clover
GENERIC :Trifolium pratense

COMMON :Red oak
GENERIC :Quercus rubor

COMMON :Rosebay Willowherb
GENERIC :Epilobium augustifolium

COMMON :Sheeps sorrel
GENERIC :Rumex acetocella

COMMON :Stinging nettle
GENERIC :Urtica dioeca

COMMON :Stitchwort
GENERIC :Stellaria spp

COMMON :Tansy
GENERIC :Tanacetum vulgare

COMMON :Thistle
GENERIC :Cirsium vulgaris

COMMON :Toadstool
GENERIC :Psilocybe spp

COMMON :White Willow
GENERIC :Salix alba

COMMON :Woody nightshade
GENERIC :Solanum dulcamara

COMMON :Yarrow
GENERIC :Achillia millefolium

COMMON :Yellow iris
GENERIC :Iris pseudacorus

Framwellgate Moor Carr Pond NZ 267454

FAUNA

Phylum ANNELIDA (Segmented Worms)
Class Oligochaeta (Bristleworms)
Enchytraeidae sp.
Lumbriculus variegatus
Naididae (incl. Nais)
Tubificidae sp.

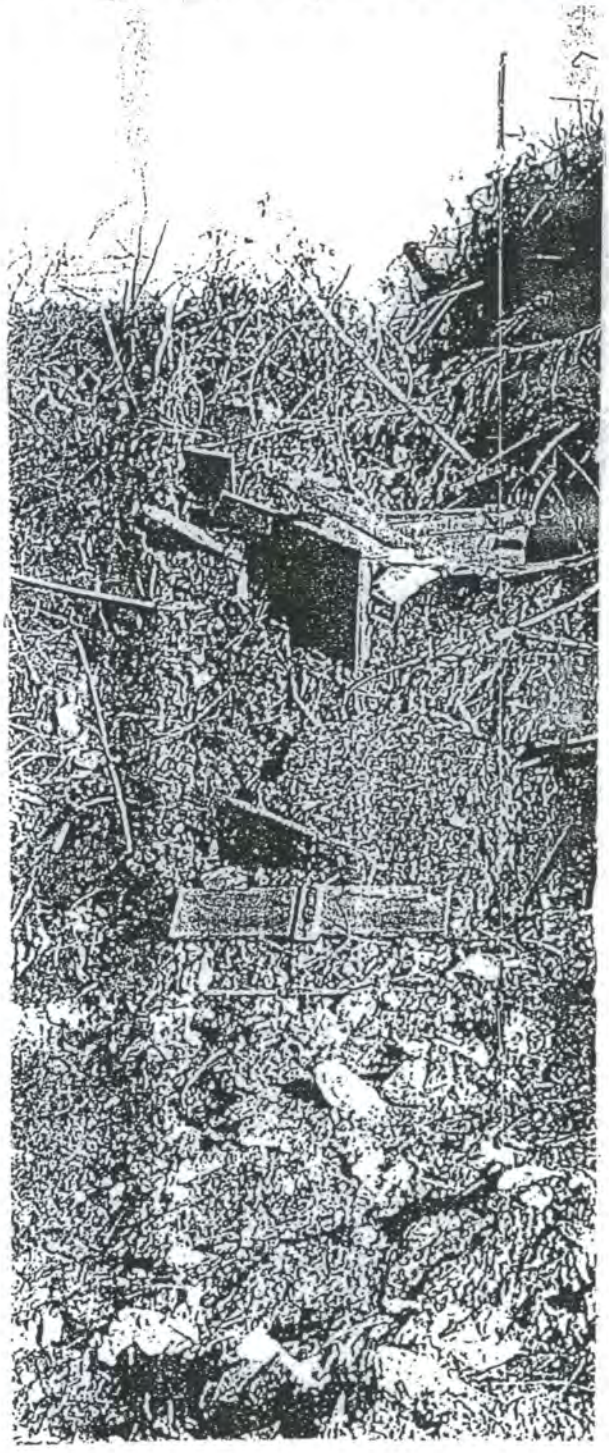
Phylum ARTHROPODA (Arthropods)
Class Crustacea (Crustaceans)
*Cyclopoid copepods
*Daphnia sp.
*Simocephalus sp.
Class Insecta (Insects)
order Collembola
Proisotoma palustris
order Ephemeroptera
*Cloëon dipterum
order Odonata
Coenagrion puella
Enallagma cyathigerum
*Ischnura elegans
*Pyrrhosoma nymphula
order Hemiptera
*Corixa punctata
*Gerris sp.
*Notonecta glauca
Sigara sp.
order Trichoptera
Limnephilus spp. including
*Limnephilus vittatus
order Coleoptera
Acilius sulcatus
Agabus bipustulatus & Lar.
*Colymbetes fuscus
*Dytiscus marginalis
Haliplus sp.
Helophorus sp.
*Hybrobius fuscipes
Hydroporus palustris
order Diptera
Ceratopogonid lar.
Chaoborus lar.
*Chironomus lar.
Culex lar.
Dixa lar.
*Tanypus lar.
Class Arachnida (Water Spiders)
Hygrobatidae sp.
Pirata sp.

FLORA

(Flowering Plants)

Phylum SPERMATOPHYTA
*Eleocharis palustris
Galium palustre
*Glyceria fluitans
Juncus articulatus
*Juncus effusus
Lemna minor
Ranunculus flammula
Solanum dulcamara

Local authorities are catching on to composting as they try to meet government recycling targets, reports Jane Moore



COMPOSTING HAS LONG BEEN recognised by gardeners as a prime way of making the most of green waste matter. Keen gardeners countrywide carefully separate potato peelings, leftover food and tea leaves for the compost heap because these are such useful materials. Now some councils are cottoning on to composting as a way of meeting government targets, as well as producing a worthwhile product.

The government has directed that around 25 per cent of all waste should be recycled by 2000. Cambridge City Council intends to meet that objective this year in terms of green waste recycling. By the end of May the council will be recycling the green waste from 11,000 households, and a quarter of the city will be sending its peelings, papers and clippings for composting.

The council has been looking at green waste recycling since 1994, when it carried out an initial trial. The council provided wheeled waste bins to 1,000 households, in addition to the standard black rubbish bins. Some of the houses had large gardens; some had small gardens or none at all. Council collections carried on as usual every week, except that on alternate weeks the truck collected the green waste and deposited it at ADAS Boxworth, six miles north-west of the city, for composting.

The environmental section of ADAS, headed by David Baldwin, began carrying out trials on different methods of composting at the Boxworth site. Studies included the ideal temperatures for decomposition and the length of time

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needed to produce good quality compost. Research trials continued at Boxworth until November last year and now a council-owned company, East Waste, has taken over the compost management and transferred it to the Milton landfill site just off the A10.

DURHAM SITES & MONUMENTS RECORD

Framwellgate Moor, Cades Road, Roman road.

SMR number : 3342
Site Type : Road
Place Name : Durham City
Site Status : Regional or local importance.
General Period : Roman - from AD70 to C5

Description :
Suggested route of road from Great Stainton to Chester-le-Street.Agger at grid reference NZ276457.

References :
1) Walton, R. Cades Road. F.I. files. 1985.

APPENDIX 15

Point References for map	OS Grid Refs
1. Mount Joy.	NZ 279416
2. Science site (near Geography building).	NZ 276415
3. Path (near Potters Bank.	NZ 270416
4. Bellasis	NZ 269417
5. Millhill Lane.	NZ 266408
6. Alnmet barn.	NZ 265416
7. Mount Oswalds golf course.	NZ 266406
8. Howlands Farm.	NZ 271407
9. path, Hollingside Wood.	NZ 276402
10.dismantled railway.	NZ 277404
11.Mount Joy cottage.	NZ 270411
12.Hollingside Lane, near Grey College.	NZ 275411
13.Elvet Hill, junction of Elvet Hill Road and Millhill Lane.	NZ 271411
14.track near Whinney Hill.	NZ 282417
15.Elvet Banks, near Church Street	NZ 274416
16.Quarryheads Lane.	NZ 271419
17.St Monica Road (near Newcastle Road).	NZ 262425
18.Friarside (private house) near Newcastle Road.	NZ 261431
19.Whitesmocks (near Newcastle Road).	NZ 258435
20.Newcastle Road	NZ 260440
21.Dryburn Hospital perimeter.	NZ 276435
22.Framwellgate Peth, near Windy Hill.	NZ 260430
23.Junction of North Road and Milburngate.	NZ 272426
24.Flassvale (near allotment gardens).	NZ 265421
25.Elvet Sands.	NZ 276431
26.path (near Ferens Park Football ground).	NZ 284431
27.Riverbank (near Bath's Bridge).	NZ 281425
28.Pelaw Wood.	NZ 286425
29.Allotment Gardens, Gilesgate.	NZ 280426
30.Claypath and Providence Row junction (near Gilesgate).	NZ 277427
31.Framwellgate Moor.	NZ 261440
32.Playing field (near King George's field).	NZ 267449
33.Pity Me Carrs.	NZ 270450
34.Framwellgate Moor school.	NZ 262445
35.Gray Avenue, Framwellgate Moor.	NZ 266445
36.Playing field (near Bracken Field Road).	NZ 272445
37.Aykley Heads Farm (private houses).	NZ 266441
38.Durham County Constabulary headquarters.	NZ 271441
39.Hylton Road, Newton Hall.	NZ 276449
40.Cycle path (near railway), Newton Hall.	NZ 278437
41.Railway embankment, (near Newton Hall).	NZ 281446
42.Near Hamsterly Crescent, Newton Hall.	NZ 270440
43.Aykley Heads playing field,woodland Perimeter.	NZ 271435
44. Agricultural land, (near River Wear).	NZ 281435
45.Path up to Frankland Farm.	NZ 282441
46.Rifle range (disused).	NZ 287441
47.Long Acres, Gilesgate.	NZ 286431
48.Near Recreation Ground, (near Sunderland Road).	NZ 291429
49.Front Street, (Gilesgate).	NZ 295424
50.Sunderland Road (Gilesgate Moor).	NZ 295431
51.Gilesgate field.	NZ 289419
52.Old Durham, (path along the river).	NZ 287421
53.Gilesgate field.	NZ 295422
54.Old Durham (near Broom Hill).	NZ 291416
55.Shincliffe, (near High Street).	NZ 291406
56.Path near Houghall College.	NZ 287411
57.Running track, (near riverside).	NZ 286416
58.dismantled railway, (near riverside).	NZ 286406
59.Mill Lane.	NZ 291411
60.Track to Old Durham Cottages.	NZ 294412

POINT REF. NO.	GRID REF.	NOISE READINGS (dBA)	pH READINGS (pH UNITS)
1.	NZ 279416	L_{MAX}: 62.5 L_{EQ}: 55.7 L_{90}: 51.5	6.5
2.	NZ 276415	L_{MAX}: 74.4 L_{EQ}: 60.1 L_{90}: 50.5	5.6
3.	NZ 270416	L_{MAX}: 60.2 L_{EQ}: 48.1 L_{90}: 42.0	6.1
4.	NZ 269417	L_{MAX}: 66.5 L_{EQ}: 52.1 L_{90}: 46.0	6.0
5.	NZ 266408	L_{MAX}: 58.5 L_{EQ}: 46.3 L_{90}: 40.5	6.0
6.	NZ 265416	L_{MAX}: 62.0 L_{EQ}: 51.5 L_{90}: 48.0	6.1
7.	NZ 266406	L_{MAX}: 58.1 L_{EQ}: 50.4 L_{90}: 47.5	6.0
8.	NZ 271407	L_{MAX}: 55.1 L_{EQ}: 45.0 L_{90}: 42.5	5.6
9.	NZ 276402	L_{MAX}: 61.4 L_{EQ}: 39.2 L_{90}: 39.5	5.9
10.	NZ 277404	L_{MAX}: 68.6 L_{EQ}: 52.6 L_{90}: 41.5	6.0

11.	NZ 270411	L_{MAX}: 54.3 L_{EQ}: 40.2 L_{90}: 39.5	6.7
12.	NZ 275411	L_{MAX}: 71.7 L_{EQ}: 56.0 L_{90}: 44.0	6.5
13.	NZ 271411	L_{MAX}: 83.3 L_{EQ}: 65.5 L_{90}: 49.5	6.2
14.	NZ 282417	L_{MAX}: 73.8 L_{EQ}: 52.8 L_{90}: 40.5	6.5
15.	NZ 274416	L_{MAX}: 65.0 L_{EQ}: 50.2 L_{90}: 46.0	6.1
16.	NZ 271419	L_{MAX}: 69.7 L_{EQ}: 52.3 L_{90}: 44.5	6.4
17.	NZ 262425	L_{MAX}: 82.7 L_{EQ}: 68.7 L_{90}: 59.5	6.5
18.	NZ 261431	L_{MAX}: 81.8 L_{EQ}: 72.1 L_{90}: 65.0	6.2
19.	NZ 258435	L_{MAX}: 81.3 L_{EQ}: 68.3 L_{90}: 62.5	7.0
20.	NZ 260440	L_{MAX}: 87.8 L_{EQ}: 72.3 L_{90}: 59.0	6.5

21.	NZ 276435	L_{MAX}: 65.7 L_{EQ}: 57.7 L_{90}: 54.0	6.5
22.	NZ 260430	L_{MAX}: 73.6 L_{EQ}: 62.2 L_{90}: 51.0	6.5
23.	NZ 272426	L_{MAX}: 85.1 L_{EQ}: 73.9 L_{90}: 61.5	6.0
24.	NZ 265421	L_{MAX}: 62.4 L_{EQ}: 52.2 L_{90}: 48.0	6.1
25.	NZ 276431	L_{MAX}: 63.8 L_{EQ}: 50.6 L_{90}: 45.5	6.0
26.	NZ 284431	L_{MAX}: 60.5 L_{EQ}: 50.1 L_{90}: 48.0	6.2
27.	NZ 281425	L_{MAX}: 54.3 L_{EQ}: 41.9 L_{90}: 39.5	6.2
28.	NZ 286425	L_{MAX}: 57.5 L_{EQ}: 43.8 L_{90}: 42.5	6.0
29.	NZ 280426	L_{MAX}: 60.3 L_{EQ}: 50.2 L_{90}: 49.0	6.2
30.	NZ 277427	L_{MAX}: 60.1 L_{EQ}: 54.0 L_{90}: 51.2	6.5

31.	NZ 261440	L_{MAX}: 70.1 L_{EQ}: 53.6 L_{90}: 38.0	6.4
32.	NZ 267449	L_{MAX}: 69.0 L_{EQ}: 46.3 L_{90}: 41.5	6.5
33.	NZ 270450	L_{MAX}: 51.7 L_{EQ}: 36.2 L_{90}: 35.0	6.4
34.	NZ 262445	L_{MAX}: 60.6 L_{EQ}: 48.4 L_{90}: 39.0	6.6
35.	NZ 266445	L_{MAX}: 72.1 L_{EQ}: 44.9 L_{90}: 37.0	6.7
36.	NZ 272445	L_{MAX}: 72.9 L_{EQ}: 59.4 L_{90}: 43.0	7.0
37.	NZ 266441	L_{MAX}: 69.0 L_{EQ}: 52.8 L_{90}: 52.8	6.8
38.	NZ 271441	L_{MAX}: 56.3 L_{EQ}: 38.9 L_{90}: 35.5	7.0
39.	NZ 276449	L_{MAX}: 65.1 L_{EQ}: 50.3 L_{90}: 47.0	6.9
40.	NZ 278437	L_{MAX}: 60.1 L_{EQ}: 50.2 L_{90}: 40.1	6.2

41.	NZ 281446	L_{MAX}: 86.0 L_{EQ}: 71.0 L_{90}: 36.0	6.3
42.	NZ 270440	L_{MAX}: 60.9 L_{EQ}: 47.3 L_{90}: 35.0	6.3
43.	NZ 271435	L_{MAX}: 79.5 L_{EQ}: 59.1 L_{90}: 35.5	6.4
44.	NZ 281435	L_{MAX}: 55.4 L_{EQ}: 41.5 L_{90}: 37.5	6.6
45.	NZ 282441	L_{MAX}: 74.3 L_{EQ}: 50.4 L_{90}: 36.0	6.8
46.	NZ 287441	L_{MAX}: 59.4 L_{EQ}: 49.1 L_{90}: 39.2	6.3
47.	NZ 286431	L_{MAX}: 56.2 L_{EQ}: 42.2 L_{90}: 38.3	6.4
48.	NZ 291429	L_{MAX}: 54.1 L_{EQ}: 42.4 L_{90}: 39.3	6.2
49.	NZ 295424	L_{MAX}: 67 .7 L_{EQ}: 44.4 L_{90}: 37.0	7.0
50.	NZ 295431	L_{MAX}: 60.1 L_{EQ}: 50.3 L_{90}: 40.2	6.5

51.	NZ 289419	L_{MAX}: 61.6 L_{EQ}: 36.0 L_{90}: 39.1	6.4
52.	NZ 287421	L_{MAX}: 50.5 L_{EQ}: 40.2 L_{90}: 31.5	7.1
53.	NZ 295422	L_{MAX}: 55.5 L_{EQ}: 39.0 L_{90}: 30.0	6.4
54.	NZ 291416	L_{MAX}: 50.7 L_{EQ}: 41.3 L_{90}: 33.0	6.5
55.	NZ 291406	L_{MAX}: 55.4 L_{EQ}: 43.1 L_{90}: 32.4	6.9
56.	NZ 287411	L_{MAX}: 80.7 L_{EQ}: 69.2 L_{90}: 45.5	6.5
57.	NZ 286416	L_{MAX}: 65.5 L_{EQ}: 47.3 L_{90}: 36.5	6.7
58.	NZ 286406	L_{MAX}: 50.0 L_{EQ}: 40.1 L_{90}: 33.0	6.4
59.	NZ 291411	L_{MAX}: 71.6 L_{EQ}: 59.0 L_{90}: 45.5	6.5
60.	NZ 294412	L_{MAX}: 59.6 L_{EQ}: 49.0 L_{90}: 39.2	6.8

APPENDIX 16

Addresses:-

Contact one of the Rural Action advisors who will give advice on projects:

1. Marie Tyler
Durham Rural Community Council
Park House, Station Road,
Lanchester,
Co Durham DH7 0EX
Tel : (01207) 529621

or

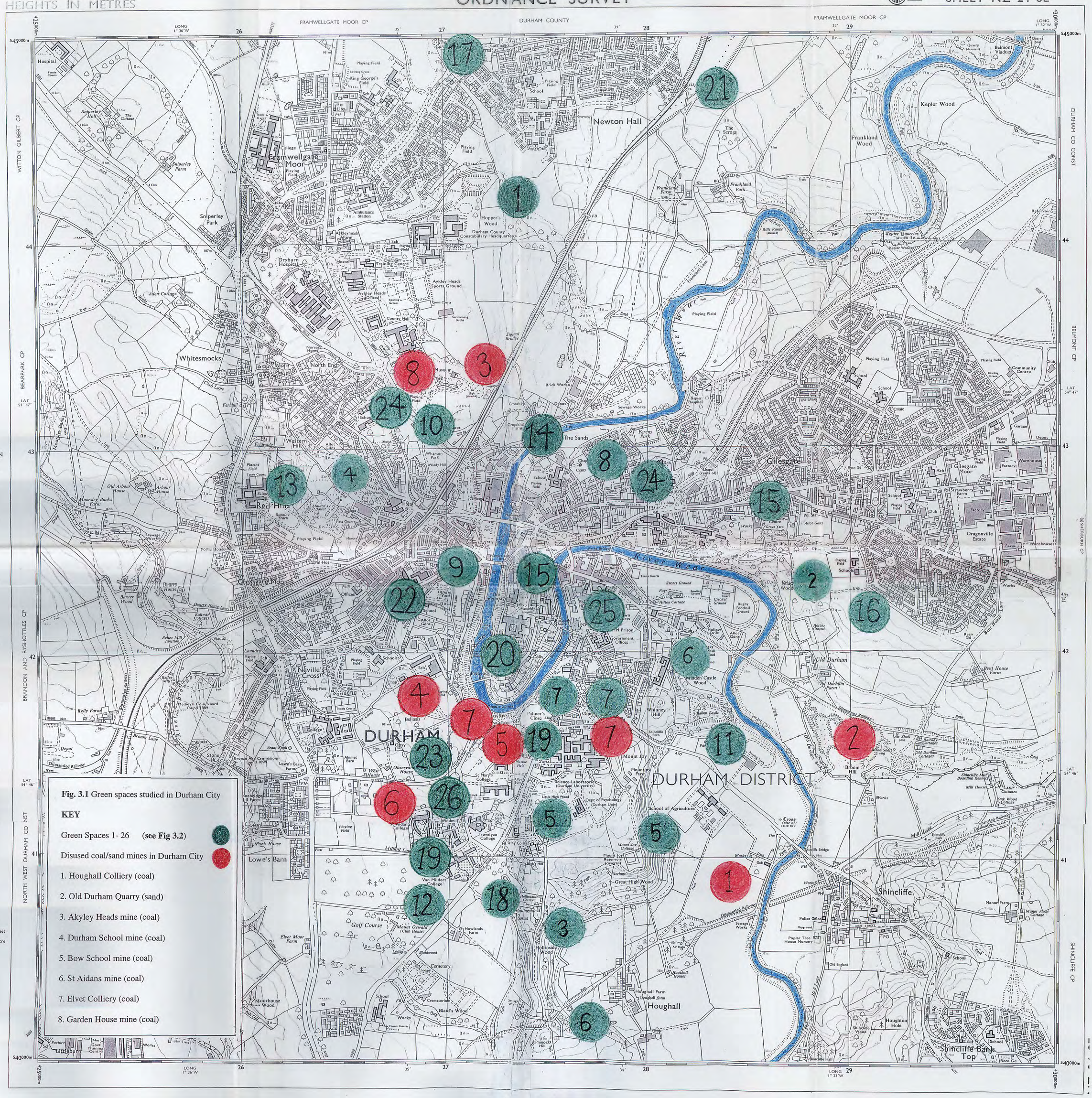
2. Carl Bendelow
Durham Dales Centre
Castle Gardens, Stanhope, Weardale
Co. Durham DL13 2FJ
Tel (01388) 527650

English Nature
Northumbria
Archbold House,
Archbold Terrace,
Newcastle upon Tyne NE2 1EG
Tel 0191 281 6316

HEIGHTS IN METRES

ORDNANCE SURVEY

SHEET NZ 24 SE


FRAMWELLGATE MOOR CP
DURHAM COUNTY
FRAMWELLGATE MOOR CP
LONG 1° 36'W
LONG 1° 32'W
545000m
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425000m
430000m
WITTON GILBERT CP
BEARPARK CP
BRANDON AND BYSHOTTLES CP
NORTH WEST DURHAM CO NST
DURHAM CO CONST
BELMONT CP
SHINCLIFFE CP
Newton Hall
Framwellgate Moor
Sniperley Park
Whitesmocks
Western Hill
Red Hills
Crossgate Moor
Neville's Cross
DURHAM
DURHAM DISTRICT
Gilesgate
The Sands
Shincliffe
Houghall
Old Durham
Kepier Wood
Frankland Wood
Belmont Viaduct
River Wear
Dryburn Hospital
Durham County Constabulary Headquarters
Durham Training Centre
Aykley Heads Sports Ground
County Hall
Hopper's Wood
Frankland Farm
Frankland Park
Kepier Quarries
Rifle Range (disused)
Kepier Hospital
Community Centre
Dragonville Estate
Gilesgate Moor
Strawberry Farm
Ferens Park
Wharton Park
Windy Hill
Crookhall Farm
Sewage Works
Brick Works
Signal Bridge
Nursery Home
North End
Museum
Fernhill
Club Lane
Moorsley Banks
Old Arbour House
Arbour House
Moorsley Banks Farm
Sewage Works
Police House
Quarry House
Baxter Wood
Railway Cottages
Relley Mill Junction
Relley Farm
Medieval Coin Hoard found 1889
Broom Lane
Dismantled Railway
Stone Br
Bronze Age Cremations found 1899
Lowe's Barn Farm
Lowe's Barn
Observatory House
West House
St Mary's College
Science Laboratories (Durham University)
Dept of Psychology (Durham Univ)
School of Agriculture
Mount Joy
Mountjoy Farm
Mount Joy Cottages
Mount Joy Reservoir (covered)
Great High Wood
Little High Wood
Whinney Hill
Palmer's Close
Bellasis
Brant Knowl
Aldans College
Trevelyan College
Grey College
Van Mildert College
Windmill Hill
Millhill Lane
Park House
Golf Course
Mount Oswald (Club House)
Elvet Moor Farm
Howlands Farm
Bloodwood
Cemetery
Crematorium
Blaid's Wood
Moorhouse Lower Wood
Hollinside Wood
Hollinsdale Cottage
Houghall Farm
Houghall Houses
Pinnockhill
Littleburn
Govt Training Centre
Old Durham Quarry (sand)
Akyley Heads mine (coal)
Durham School mine (coal)
Bow School mine (coal)
St Aidans mine (coal)
Elvet Colliery (coal)
Garden House mine (coal)
Houghall Colliery (coal)
Shincliffe Bank Top
Houghton Hole
Broom Hill
Old Durham Cottages
Old Durham Farm
Bent House Farm
Whitton Castle Wood
Hollaton Castle
Shincliffe Hall
Shincliffe Wood
Manor Farm
Manor Farm Cottage
Poplar Tree House Nursery
Police Office
Old England
The Croft
Shincliffe Mill Boarding Kennels
Mill House
Oak Wood Cottage
Mill Cottages
Mill Lane
Shincliffe Bridge
Shincliffe Park
Dismantled Railway
Air Shaft
Mine Shaft
Rifle Range (disused)
Kepier Quarries (disused)
Quarry (disused)
Belmont Viaduct
Pelaw Wood
Pelaw Wood Beck
Hollaton Castle
Hollaton Castle Wood
Hollaton Castle Wood
Hollaton Castle Wood